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Amateur Radio CQ

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AUGUST 1982 $2.00

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THE RADIO AMATEUR'S JOURNAL

TS-830S

"Top-notch"...VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- Wide receiver dynamic range, Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Noise-blanker threshold level control.
- Built-in digital display, (fluorescent tube), with analog dial.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

NEW

Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120S, TS530S, and TS-830S.)

TS-130SE

"Small talk"...IF shift, Processor, N/W switch, affordable.

A compact, all solid-state HF SSB/CW transceiver for mobile or fixed base station, covering 3.5 to 29.7 MHz.

TS-130SE FEATURES:

- 80-10 meters including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- TS-130SE runs 200 W PEP/160 W DC input on 80-15 meters, 160 W PEP/140 W DC on 12 and 10 meters. TS-130V version at 25 W PEP/20 W DC, all bands, also available.
- Digital display, built-in.
- IF shift circuit.
- Speech Processor, built in.
- Narrow/wide filter selection on CW and SSB with optional filters.
- Automatic SSB mode selection (LSB on 40 meters and below, USB on 30 meters and up). SSB reverse switch provided.
- RF attenuator, built-in.
- Final amplifier protection circuit assures maximum reliability. Output power is reduced if abnormal operating conditions occur. For very severe operations, optional cooling fan, FA-4, is available. TS-130S, with FA-4 installed, also available.
- Effective noise blanker.
- Dimensions: 3-3/4 H x 9-1/2 W x 11-9/16 D (inches). Weight: 12.3 lbs.
- Other features: VOX, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.

Optional accessories:

- PS-30 matching power supply (TS-130SE).
- KPS-21 power supply (TS-130SE).
- PS-20 power supply (TS-130V).
- SP-120 external speaker.
- VFO-120 remote VFO.
- FA-4 fan unit (TS-130SE).
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 antenna tuner.
- MB-100 mobile mounting bracket.

KENWOOD
TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

TR-2500

BIG performance, small size, smaller price!

The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 memories, lithium battery memory back-up, memory scan, programmable automatic band-scan, Hi/Lo power switch and built-in sub-tone encoder.

TR-2500 FEATURES:

- Extremely compact and light weight 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches), 540 g, (1.2 lbs) with NiCd pack.
- LCD digital frequency readout.
- Ten memories includes "MO" memory for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- Memory scan.
- Programmable automatic band scan allows upper and lower frequency limits and scan steps of 5 kHz and larger (5, 10, 15, 20, 30 kHz . . . etc) to be programmed.

CONVENIENT TOP CONTROLS

- UP/DOWN manual scan.
- Repeater reverse operation.
- 2.5 W or 300 mW RF output. (HI/LOW power switch).
- Built-in tunable (with variable resistor) sub-tone encoder.
- Built-in 16-key autopatch.
- Slide-lock battery pack.
- Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz in 5 kHz steps.
- Optional power source, MS-1 mobile or ST-2 AC charger/ power supply allows operation while charging. (Automatic drop-in connections.)
- High impact plastic case.
- Battery status indicator.
- Two lock switches for keyboard and transmit.

Standard accessories:

- Flexible rubberized antenna with BNC connector.
- 400 mAH heavy-duty Ni-Cd battery pack.
- AC Charger.

Optional accessories:
- VB-2530 25 W RF Power amp, BNC-BNC cables, and mounting bracket, supplied.
- MS-1 13.8 VDC mobile stand/ charger/power supply.

Optional accessories:
- ST-2 Base station power supply and quick charger (approx 1 hr.)
- TU-1 Programmable "DIP switch" (CTCSS) encoder.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.
- PB-25 Extra Ni-Cd battery pack, 400 mAH, heavy-duty.
- BT-1 Battery case for AA manganese or alkaline cells.
- BH-2 Belt hook.
- WS-1 Wrist strap.
- EP-1 Earphone.

NEW

Optional accessories:
- KPS-7 DC power supply for TR-9130 base station operation. 7 A intermittent, 6 A continuous, protection circuit built-in.
- SP-40 compact mobile speaker. Only 2-11/16 W x 2-1/2 H x 2-1/8 D (inches). Handles 3 watts of audio.
- TK-1 AC adapter for memory back-up (not shown).

TR-9130

All mode (FM/SSB/CW) 25 watts, plus...!!!

The TR-9130 is a powerful, yet compact, 25 watt FM/USB/LSB/ CW transceiver, featuring six memories, memory scan, memory back-up capability, automatic band scan, all-mode squelch, and CW semi break-in. Available with a 16-key autopatch UP/ DOWN microphone (MC-46), or a basic UP/DOWN microphone.

TR-9130 FEATURES:

- 25 Watts RF output on all modes, (FM/SSB/CW).
- FM/USB/LSB/CW all mode. The mode switch, with the digital step (DS) switch, determines the size (100 Hz, 1 kHz, 5 kHz, 10 kHz) of the tuning step.
- Six memories. On FM, memories 1-5 for simplex or ±600 kHz offset, using OFFSET switch, Memory 6 for non-standard offset. All six memories may be simplex, any mode.
- Memory scan. Scans memories in which data is stored.
- Internal battery memory back-up, using 9 V Ni-Cd battery, (not KENWOOD supplied). Memories are retained approx. 24 hours, adequate for the typical move from base to mobile. External back-up terminal on the rear.
- Automatic band scan. Scans within whole 1 MHz segments (ie., 144.0-144.999 MHz).
- Dual digital VFO's.
- Transmit frequency tuning while transmitting, for OSCAR operations.
- Squelch circuit, all modes (FM/SSB/CW).
- Repeater reverse switch.
- Tone switch.
- CW semi break-in circuit with sidetone.
- Digital display with green LED's.
- Compact size and lightweight. 170 (6-11/16) W x 68 (2-11/16) H x 241 (9-1/2) D mm (inch). 2.4 kg (5.3 lbs.) weight.
- Covers 143.9 to 148.9999 MHz.
- HI/LOW power switch. 25 or 5 watts on FM or CW.
- Transmit offset switch.
- High performance noise blanker.
- RF gain control. • RIT circuit.

KENWOOD
TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

ST-144/µP, 2 Meter FM

It's Time!

■ It's time you got your share of the excitement of full-feature synthesized handheld operations. ■ SANTEC(nology zaps to the lead of the state-of-the-art in 2 meter handhelds with the new ST-144/µP. ■ Only SANTEC hands you all the up-to-the-minute features of this "clockwise" precision jewel.

■ The 24 hour format digital clock on the LCD display is uniquely SANTEC, and it typifies the thoughtful operator-oriented design incorporated throughout the ST-144/µP. ■ Not only does it give you accurate time checks whenever you want, but also it can display the time instead of the frequency, while this handful of radio continues to operate on your "favorite" frequency.

17-42 39

24 Hr Clock provides time of day even while the radio is turned off, or it can be selected by the front panel switch while in QSO.

MAN BATT RX 147.270 MHz

Full Frequency Display showing offset selected, battery condition and current scan mode. At turnon, the contents of M-1 are loaded into the operating register, and the display looks like this.

M MAN BATT RX 5 146.145 MHz

The Memory Mode is indicated by the small "M" above "+": the "5" indicates that the data were stored in Memory 5 before recall. The "+" indicates that the + offset was stored with the frequency.

M SCAN BATT RX 9 144.145 MHz

Memory Scan with "Priority Scan/Auto-Resume" has stopped on Memory 9 to listen for a few seconds.

M SRCH BATT TX −6 146.220 MHz

Transmit is indicated on a minus 600 kHz offset from 146.820 MHz which was stored in M-6. Activity on Memory 6 was found by using the "Search" mode of Scan.

■ The 10 frequencies that you put into the memories are stored with your repeater offsets, and you can have them scanned, searched or instantly recalled at the touch of a button. ■ Memory 1 even gets priority treatment in the memory scan mode. ■ That's timely complexity made amazingly simple: and the high power option of 3.5W (nominal) is simply the greatest reach you've ever held in your hand.

■ "Battery saver" function by the computer to hoard battery power when the frequency is quiet ■ Programmed limits for both ends of bandscan ■ Simplified frequency entry only by keyboard ■ Full capacity, low impedance audio output to drive an external speaker ■ Wide band span for MARS, CAP, AF MARS: 142.00-149.995 MHz ■ Quick-change 500mAh battery ■ Separate level controls for MIC, TT, PL and DEV ■ & so much more that we don't have space to mention ■ SANTEC hands it all over, while others can't even give you the time of day.

All stated specifications are subject to change without notice or obligation.

Accessories for SANTEC Handheld Radios
clockwise from upper left:
- **Leather Case (ST-LC)**
- **Base Charger & Power Supply (ST-5BC)**
- **Remote Speaker (MS-50S)**
- **Mobile Charger (ST-MC)**
- **Speaker Microphone (SM-1)**

Sale of the ST-144/µP is subject to FCC certification: approval and availability expected January, 1982.

SANTEC

2000 Avenue G, Suite 800, Plano, Texas 75074
Phone (214) 423-0024 • INTL TLX 203920 ENCOM UR

Encomm, Inc.
2000 Avenue G
Suite 800
Plano TX 75074

Please send me more information about:
☐ The ST-144/µP
☐ Authorized SANTEC Dealers

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ADDRESS ______
CITY ______ STATE ______ ZIP ______

CQ

YOU MAY SEND A DUPLICATE OF THIS FORM.

MASTHEAD

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CQ The Radio Amateur's Journal

ON THE COVER: Antenna system at OH2BH. The 42 meter (140 foot) high rotatable tower has been made and erected by Jaakko Vartiainen, OH8QD. It is guyed with non-metallic Parafil rope, specially designed for these applications, and rotated by a heavy-duty ART-8000 rotator at its base. KLM 6-el beams are used, stacked 6 over 6 on 14 MHz (140/70 feet), and singles on 21 and 28 MHz (120/95 feet). The 14 MHz spacing is 1λ, and necessary separation is allowed between the other beams to eliminate coupling. All configurations can be switched by the set of vacuum relays located at 32 meters (105 feet). We are grateful to the late Jim Lawson, W2PV, and Frank Clement, W6KPC, for their assistance in electrical and mechanical construction.

AUGUST 1982 **VOL. 38, NO. 8**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

My predictions in July's Zero Bias went a little awry with respect to May Meanderings. Dick and I did go to Birmingham for the BirmingHamfest and had a good time as usual. The attendance was up from last year, and there seemed to be more people exhibiting their wares. In fact, this seems to be the trend in hamfests for 1982 . . . more people and more stuff to look at and hopefully buy. Two *CQ* stalwarts, Karl Thurber, W8FX, and Dave Ingram, K4TWJ, were in attendance and spent some time at the *CQ* booth. The fleamarket was full of goodies, and I did manage to buy a few (I have no idea yet as to their eventual use, but the price was right). One interesting item that caused a stir was little cans of "Potted Possum." This novelty item actually contained (or so it was purported) potted meat packaged by Hormel products. The "Potted Possum" labels, which are very funny, were put on later. Anyway, it's a great gag gift, and one of those things you leave around your kitchen to surprise your guests.

On May 23rd, as reported, I did go to the LIMARC fleamarket. Their weather patterns traditionally are governed by the same forces that control Dayton. They either have rain or snow for their events, or in one rare instance (which everyone around here still talks about) it was in the upper 90s and sure sunstroke weather. This time the day started out dark, dreary, cold, overcast, and damp. That was the high point of the day. Several thousand amateurs showed up to buy and sell. The wheeling and dealing started at about 8:00 a.m. The weather got progressively worse, and by 11:00 a.m. the rains started in earnest. It's hard to sell soggy stuff, but that's what was happening as eager amateurs kept wheeling and dealing in the rain. I chickened out and left at about noon, cold, wet, and a few bucks ahead.

The change in May Meanderings comes about with respect to the Knoxville Hamfest. It was Jack, W2LZX, who went with Herb to represent *CQ* at this one. Jack and Herb managed to get to the World's Fair to check it out, and Jack even got in a little operating time at the World's Fair amateur radio station. In between sightseeing they did manage to put in some hard work and brought back well wishes from the folks in Tennessee, plus a bunch of new *CQ* subscriptions.

The first weekend in June was extremely busy for the intrepid *CQ* crew. Dick, his wife, Cathy, and I went to Dallas for Ham-Comm, Jack went to San Diego and met up with Rich, WØYZ, and Herb went to Chicago for the start of the C.E.S. show. Dallas was terrific. The weather was in our favor (the rains had stopped and it wasn't too hot), and the folks who turned out were receptive to the idea of having a good time. We finally got a chance to see Laura, the new daughter of Dan and Sandy Mitchell of The Ham Shack. At four months old she's a seasoned trooper, having been at both Dayton and Dallas.

After the show on Saturday, a lot of the exhibitors (as per usual) gathered at the lounge to help ease the pain of standing all day and to swap stories. This time the conversation centered on first rigs as Novices and who had their licenses first. One newcomer to the group was Don Kiefer, W5QXK, who has recently joined Gerald Williamson, K5GW, of Texas Towers as National Sales Manager. The talk shifted to Tall Texas Tales, and I can't remember whether it was here or the next day that Terry Stoltey,WB9THH,of HAL Communications regaled us with his tale of fighting off this Texas-size insect in the middle of the night. Everything seems big in Texas.

On Sunday, Dick and Cathy flew to Chicago for the C.E.S. show. I flew home to work on this editorial and to put the finishing touches on the issue. Jack phoned in to report on the San Diego show. He said that the turnout was good and the only drawback was that the fleamarket was some distance away from the main show. Jack will join Dick and me later on this week for the Atlanta HamFestival. Next week Dick and I will be in Washington, D.C. for the amateur radio luncheon sponsored by AFCEA.

Contest Season

The contest season is coming up, and the staff is gearing up first to handle the two results issues and then the onslaught of mail associated with logs, rules, and the like. As our contests get bigger each year, preparing the results for print gets to be a monumental task. It's almost like going to the dentist; you know you have to go, but it's not really high on your "fun things to do" list. However, it is a culmination of a lot of hard work by the committee for the better part of a year and our own in-house work of several weeks.

One note for those of you who know non-*CQ* readers. Many of those people still send logs and log requests to the old address in Port Washington. Over these last three years we have given the Port Washington Post Office instructions on forwarding the mail, but to no avail. I've picked up the mail on my way to work on occasion, but that will stop by the end of the summer. That address will no longer function for mail delivery—especially *CQ* mail. This will result in contest mail being either returned to the sender (if sent first class), or I guess simply destroyed by the post office. In any event, it will not reach us in Hicksville. We'd appreciate it if you would help pass the word along to those who ask.

Antennas

As this is our Antenna Issue, I'm sort of embarrassed to report that my antenna is still alongside the house. Most of the blame lies with me and my travels. A major setback was a tragic situation involving Woody, K2UU's son. His son was riding his bike when he was hit by a car that seemed to swerve right into him. Witnesses say that the apparently drunk driver stopped, got out of the car, looked at the sprawled, bleeding boy, got back in his car, and took off. For some days it was really touch and go, but I am glad to report that the boy is now home and on his way to recovery. At this writing the driver has not been apprehended.

The Travels of August

By the time this issue reaches most of you, we also will have been to the National at Cedar Rapids and possibly a side trip or two. Lew McCoy, W1ICP, will be holding down the fort at the Flagstaff Arizona show early in August. Naturally, if you're in the area, stop by to say hello and take in these events. Part of the enjoyment of our hobby (or service) is that first-hand look at new equipment and the chance to meet your friends face to face. Besides having a good time, it's a show of support for the local sponsoring group and for the people in the amateur radio industry who come to show their wares.

73, Alan, K2EEK

In the proud tradition of the S/Line and KWM-2: Collins KWM-380.

What is "tradition"? Fifty years of HF communications experience and a high technology base that makes us an industry leader. Plus added value like the KWM-380 12-month warranty and 24-hour factory "burn-in" followed by individual testing and calibration of each transceiver.

The Collins KWM-380 gives you "tradition" in one box. Microprocessor control provides operation from the front panel or optional remote interface connector. Plug-in read-only-memory I.C. allows the addition of WARC band changes. Built-in AC/DC power supply lets you operate almost anywhere.

Rate selectable tuning to 10 Hz with frequency memory and split VFO provide excellent operational flexibility.

The Collins KWM-380. A sound investment that offers excellent resale value. See it at your authorized dealer. Collins Telecommunications Products Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, Iowa 52498. Phone 319/395-5963. Telex 464-435.

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CIRCLE 16 ON READER SERVICE CARD

Our Readers Say

QRP Issue Whets the Appetite

Editor, *CQ:*

The June QRP special issue was truly outstanding. Congratulations to the entire staff on assembling a fine collection of articles.

Now that you've whetted the appetite of every QRPer with the cover shot of Milt Mann, W9PRH, and his traveling QRP rig and antenna, I hope you will bring us a "how-to" article on both. Don't tease us with pic only!

Fred Bonavita, W5QJM
Austin, TX

A Challenge for Us All

Editor, *CQ:*

I thoroughly enjoyed your Editorial in the May 1982 issue of *CQ.* As to a code-free license, I would subscribe to a VHF-UHF-SHF license which would be code-free, but below 144 MHz—no way! I am an old brass-pounder, both Land-Line Morse and International, can still copy 60 wpm, and in my old press days could copy one to three sentences behind, stopping to change "book," which many hams today do not know about. An amateur license in the HF spectrum should never become codeless, and I would fight to the death to prevent it ever happening. Code has always been the most romantic part of amateur radio . . . . However, status quo has never been good for communicators; they become stale and unable to cope with changes. Changes are inevitable throughout time. . . .

I never entered the amateur service through Novice . . . have been a licensed man for 65 years, both ham and commercial. Even had the old Extra First Class Commercial license years back (pink and beautifully embossed). But all of that doesn't make me the *best ham.* It is what I think, what I do, how I help my fellow amateur, my community, emergency or otherwise, how I conduct myself as an operator on the air, etc., that makes me the ham I am. . . .

I heartily agree with you . . . that the future of the amateur radio service looks good. To me it looks far better than it did even five years ago. There will be exciting times ahead; any future is always exciting. I can remember back before World War I when I saw my first Curtis Bi-plane pusher, with the shovel man (pilot) sitting out in front. Gads, could there be a future in those things? There was and still is! I can remember my first spark, my first synchronous rotary spark gap, then the 1 kw spark . . . my first tube transmitter with one RCA UV202! . . . Boy, those were the days! Those days gave us the future we have today, and what we are doing today will bring the many exciting developments of the future. We have only scratched the surface of what is to come. I honestly believe that. If we should live another 25 years, we will be amazed at what will be then. The challenge is for all of us.

Col. Ronald G. Martin, W6ZF
Napa, CA

Diagrams Make the Difference

Editor, *CQ:*

I must say that I found your April issue quite interesting. Although I am not an amateur operator, I thought the highly detailed diagrams that accompanied articles such as "The Threat to Molecular Electronics from Microbes Produced by Genetic Engineering," "The World of Video," and the article on rigging and erecting antennas, made the articles much more interesting and understandable.

Victor Bentley
Dartmouth, Nova Scotia, Canada

For the Beginner

Editor, *CQ:*

The big reason that I prefer *CQ* is that your magazine has much more help for the Novice who is trying to get a start than any of the other publications. I belong to the League, and I feel that every radio amateur should, but *QST* seems more slanted to the Ph.D. in EE who first got on the air with a spark gap transmitter and can copy 40 wpm on the mill while he is engaging in a casual conversation.

Perhaps some day I'll grow into *QST,* but in the meantime I need articles like W6DDB is writing.

Dean E. Strand, KA0KKZ
Davenport, IA

ntroducing a new dimension...

COMPUTERIZED ANTENNA CONTROL FROM PRO-SEARCH™

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ntesters:

-Search seeks out a -programmed heading, plus res various common head- s and automatically scans those rare multipliers, ng the operator hands-free ration and more time for testing.

ers:

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No modifications are necessary.

Disconnect your present antenna control system and connect ours.

Pro-Search is presently used with HAM-M, HAM-II, III, IV, and T^2X Other models will be available to work with the HDR-300, etc.

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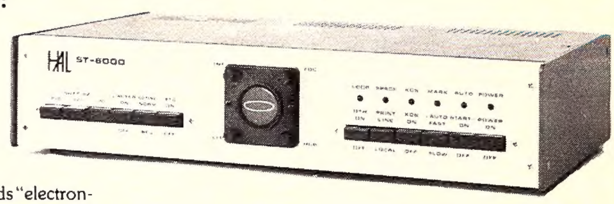
The DS3100ASR Terminal and ST6000 Demodulator are the choice of professional RTTY operators the world over. Some of the advanced features offered by this equipment are:



DS3100ASR:

● True ASR capabilities ● 200 line display storage ● 150 lines receive ● 50 lines transmit ● Baudot, ASCII, and Morse Codes ● 45 to 9600 baud RTTY ● 5 to 175 WPM CW ● WORD, LINE, and CONTINUOUS modes ● SYNC idle ("diddle") ● Unshift on space (USOS) ● WRU answerback ● Selective call printer control (SELCAL) ● Serial ASCII printer output for received text in any code ● Four keyboard controlled accessory switches ● RS232 or loop RTTY I/O ● 10 user-programmable HERE IS messages ● EAROM non-volatile storage of 4 HERE IS messages and operating conditions ● On-screen status indicators ● Custom labeled 3-legend keytops for non-confusing control operations ● Built-in 12 inch P31 display ● 120/240V, 50/60 Hz AC ● 13.5″ × 20.5″ × 15.25″ ● 60 lbs. (two cartons)

MSO3100:

● Inserts into DS3100 ● Adds "electronic mail box" to DS3100 ● Extends DS3100 storage by 32K ● Works with all codes, Baudot, ASCII, or CW ● User-programmable call-up code ● May be used with 'KOS to switch TX and RX on/off ● Inserts CW ID when required ● Sends user "HELP" and "RYRY" and "QBF" test messages when requested ● Lists directory contents, size, and date created ● Allows password for delete or read protection of files ● Use for brag tapes as well as for message storage ● Commands include: ".DIR .SDIR .READ .WRITE .ENDFILE .HELP .SEND .FILE-HELP .KY1ON .KY1OFF .KY2ON .KY2OFF .PRINTON .PRINTOFF .QBF .RYS .DELETE .EXIT" ● Factory installation only

ST6000:

● Super RTTY demodulator ● Perfect companion to DS310 "dream station" ● All three standard RTTY shifts (170-425-850 ● Receive and Transmit circuitry ● Transmit tones crystal contr ● Transmit CW ID - 100 Hz shift down in frequency ● Availabl "high" or "low" tones (*High tones recommended for United Sta* 2125 Hz mark) ● Wide bandwidth limiter for superior signal cap ● FM or AM operation ● Multipole active filter front-end ● A filter discriminator ● Active low pass filter ● Synthesized tran tone outputs ● ATC (automatic tone threshold control) ● DTH cision threshold hysteresis) ● RS232, MIL188, CMOS, and cu loop I/O ● Built-in 175 VDC, 60 ma neutral loop supply ● M control relay for autostart ● Antispace ● Built-in tuning oscillos ● 120/240V, 50/60 Hz AC ● Table or Rack cabinet (sp which) ● 3.5″ × 9″ × 17″ ● 15 lbs.

PORTABLE RTTY and CW

The HAL CWR6850 brings a new dimension to amateur RTTY operation - PORTABILITY! Even though the size is small, the features are many:

CWR6850:

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● Matches CT2100 cabinet ● Gives crossed-ellipse type of RTTY tuning indication for CT2100 ● Also includes built-in 175 VDC, 60 ma current loop supply ● Connects directly to CT2100 rear panel ● Also may be used with these other HAL products: DS2050, DS2000, ST5000, CWR685, CWR6850, CWR670, CWR6700, and ST5 or ST6 (with modification) ● One inch green phosphor CRT ● Front panel positon, focus, and intensity controls ● 120/240V, 50/60 Hz AC ● 3.5″ × 8.25″ × 10.156″ ● 12 lbs.

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CWR6700:

● Receive ASCII, Baudot, or Morse code transmissions and see the decoded characters on the TV monitor screen ● RTTY speeds from 45 to 300 baud (60, 66, 75, 100, and 300 wpm) ● CW speeds from 4 to 50 wpm ● Unshift on space (UOS) for Baudot reception ● Parallel ASCII printer output ● Printer prints received ASCII, Baudot, or Morse signals ● Requires external TV monitor (HAL KG12 or ESM914 recommended) ● Runs on 12 VDC, 0.8 Ampere ● 8″ × 2.85″ × 12.6″ ● 8 lbs

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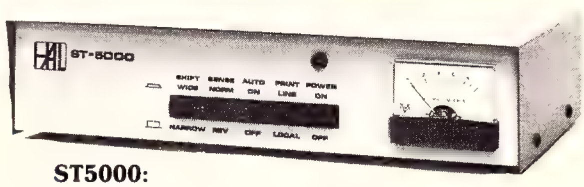

ST5000:

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- **The following hamfests, fleamarkets, etc., are slated for August:**

Aug. 1, **45th Annual South Hills Brass Pounders & Modulators Hamfest,** Pittsburgh, PA. Contact Andrew L. Pato, WA3PBD, 1433 Schauffler Dr., West Homestead, PA 15120.

Aug. 1, **Black River ARC 29th Annual Southwestern Michigan VHF Picnic,** West Side County Park, near Glenn, MI. Contact Ed Alderman, KI8Z, RR #2, Box 44, Lawrence, MI 49064.

Aug. 6–8, **50th Annual WIMU Amateur Radio Convention,** West Yellowstone, MT. Contact WIMU Convention, Rt. 3, Box 400, Rexburg, ID 83440.

Aug. 7–8, **9th Annual Jacksonville Hamfest and Northern Florida ARRL Convention,** Jacksonville, FL. Contact Robert J. Cutting, W2KGI, 1249 Cape Charles Ave., Atlantic Beach, FL 32233.

Aug. 8, **St. Cloud Radio Club Hamfest,** Sauk Rapids, MN. Contact Mike Lynch, 2115 First St. South, St. Cloud, MN 56301.

Aug. 8, **Valley of the Moon ARC Ham Breakfast & Swap Meet,** Sonoma, CA. Contact Darrel, WD6BOR, 707-938-8086.

Aug. 13–15, **Texas VHF Society 1982 Summer Meeting,** Houston, TX. Contact Texas VHF-FM Society, Summer Session, P.O. Box 73, Texas City, TX 77590.

Aug. 14–15, **Radio Club of Tacoma Hamfair 82,** Tacoma, WA. Contact Grace Teitzel, 701 So. 120th, Tacoma, WA 98444.

Aug. 15, **Iowa 75 Meter Net Picnic and Swapfest,** Ames, IA. Contact WB0JFF.

Aug. 15, **Warren ARA 25th Annual Hamfest,** Warren, OH. Contact Dick Hunter, K8WYY, Warren Hamfest, P.O. Box 809, Warren, OH 44482.

Aug. 15, **Tippecanoe ARA 11th Annual Hamfest,** Lafayette, IN. Contact Lafayette Hamfest, Route 1, Box 63, West Point, IN 47992.

Aug. 21, **Tioga County ARC 6th Annual Hamfest,** Blossburg, PA. Contact Tioga Co. ARC, P.O. Box 56, Mansfield, PA 16933.

Aug. 21, **Northern Chautauqua ARC Lake Erie Hamfest,** Dunkirk, NY. Contact Ron Warren, WA2LPB, P.O. Box 455, Dunkirk, NY 14048.

Aug. 21–22, **Huntsville Hamfest,** Huntsville, AL. Contact Huntsville Hamfest, P.O. Box 4563, Huntsville, AL 35802.

Aug. 22, **St. Charles ARC Hamfest 82,** Wentzville Missouri Community Club. Contact SCARC Hamfest 82, c/o Mike McCrann, WD0GSY, 25 Elm St., St. Peters, MO 63376.

(continued on p. 104)

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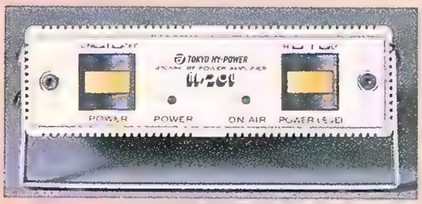

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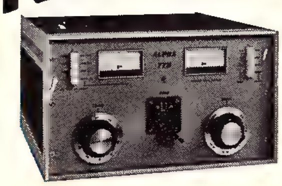

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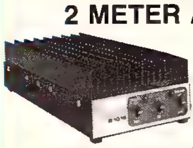

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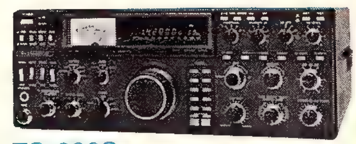

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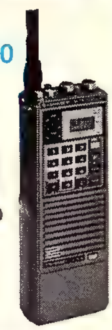

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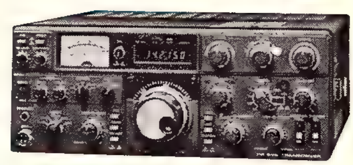

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LONG WIRE ANTENNAS

BY PHILIP S. RAND*, W1DBM

Phil Rand is one of those people who are legends in their own time. He pioneered work in t.v.i. and his Television Interference *book is still a classic and very worthwhile reading. His writings in CQ date back to the late 1940s, and it is indeed an honor to once again present his work on these pages.* —*K2EEK*

The development of antennas for high-frequency use during the 1920s centered around those using "standing" waves and those using "traveling" waves.[1] A standing-wave antenna is a resonant wire such as a half-wave dipole or a longer wire tuned to resonance so that it supports maximums and minimums of current and voltage along its length. A traveling-wave antenna, on the other hand, is a wire that has a constant value of current and voltage along its length like a transmission line. It must therefore be terminated at its far end with a non-inductive resistor equal to its characteristic impedance.[2] Some examples of this type of antenna are Beverage, rhombic, fishbone, and terminated "V" beam. Most antennas used by amateurs are of the standing-wave type. These can be divided into two types: center-fed and end-fed. Most dipoles and all rotary beams are center-fed, while most long wires are end-fed. Center-feeding an antenna produces a symmetrical radiation pattern which is desirable for a rotary beam. End-feeding an antenna produces a distorted radiation pattern which is useful in constructing long-wire beams.[3]

Back in 1931, when I was first licensed, it was common practice to end-feed an antenna by bringing the end of the long wire right into the shack and connecting it directly to the final tank coil. This, of course, is not practical today because of the requirement for attenuating harmonics and other spurious emissions that can cause t.v.i. Today we feed the r.f. from the transmitter through coaxial cable to a low-pass filter, to an s.w.r. meter, to an antenna tuner, and then to the end of the long-wire antenna.

*P.O. Box 8, Haverhill, NH 03675

Long Wires

With inflation and the high cost of rotary beams, tilt-over towers, rotators, and coax cable, probably the simplest and cheapest high-gain antennas from a constructional point of view are those using electrically long wires. The wire length is usually from one to eight wavelengths, and long wires may be excited so as to support either standing or traveling waves as desired. They usually have some of both types of waves. Since, by definition, a long-wire antenna is one which is long in terms of wavelengths, a wire 135 feet long would qualify as a long-wire antenna on 10 meters where it is 4 wavelengths long, but on 80 meters it is only a half-wave dipole.

Advantages and Disadvantages

The big advantage of a long-wire antenna is its low cost and ease of erection. Another advantage is that it can be used on all amateur bands including the new WARC bands and even 6 meters with a special tuner. As a beam antenna, its gain and directivity increase with its length in wavelengths, and expensive crank-up tilt-over towers are not required.

On the disadvantage side, a long-wire antenna cannot be rotated. To cover all directions you must put up at least four of them. The horizontal and vertical angles of radiation change from band to band. An end-fed long-wire antenna cannot be fed with coax cable. Also, during heavy rain or snow storms, a long wire is often subject to precipitation static. The biggest disadvantage is that it requires a large amount of real estate.

Length

The actual length of your long-wire antenna will be determined, of course, by the size of your property. An optimum-

Length of Antenna in Wavelengths	Angle of Main Lobes from Wire in Degrees	Power Gain Over Dipole in dB	Bands for a 560-foot Long-Wire Antenna
½	90	0	B.C.
1	54	.8	160 m
2	36	1.8	80 m
4	26	3.4	40 m
5½	21	4.5	30 m
8	17½	6.5	20 m
10½	17	7.5	16 m
12	16	8.5	15 m
14	15	9.2	12 m
16	14	10	10 m

Table I– This table shows the relationship of the length of the long-wire antenna in wavelengths to the horizontal angle of the main lobes, the gain, and the amateur bands for a wire 560 feet long. A gain of 6 dB is equal to increasing the transmitter's power four times; 10 dB equals a transmitter power increase of ten times.

size antenna would be one which is from 4 to 16 wavelengths long on the highest frequency that you use. This could be from 280 to 560 feet or longer if you have the room. An ideal setup would be to combine four or more of these long wires like the spokes of a wheel to make a series of "V" beams. The wires are used singly or in pairs. Thirty-six degrees makes a good angle between the wires. It divides evenly into 360 and is also twice the angle in Table I, Column 2, for an 8-wavelength antenna for 20 meters.

Directivity

Most amateurs think of an antenna as radiating its maximum signal at right angles to the wire as shown in fig. 1(A). This is only true of an antenna that is ½ wavelength long. As the length of the wire increases in wavelengths, the radiation pattern changes into a figure "X" pattern as shown in fig. 1(B). The shape of the figure "X" also changes with increased length, getting flatter as the length gets longer as in fig. 1(C). In the case of an antenna 560 feet long, the directivity from either side of the wire would be as shown in Table I, Column 2. These are the horizontal angles of the four main, or strongest, lobes with respect to the wire for each of the amateur bands given in Column 4. Note in Column 1 that a 560-foot wire would be 8 wavelengths long on 20 meters.

Vertical Angle of Radiation

The vertical angle of radiation from a half-wave antenna varies with its height above a perfect ground as shown in Table II. An antenna used on several bands will have a different electrical height on each band. Table II compares two antennas, one at a physical height of 35 feet and one at 70 feet, giving both the electrical height and the angles of radiation for each amateur band. At electrical heights of ¼ wave and less, the ground acts as a reflector on a beam and reflects the signal straight up in the air. Fortunately, the vertical lobe is a big fat one, so there is plenty of radiated signal at useful angles for 160, 80, and 40 meters where high angle radiation is needed for out to say 500 to 1000 miles. Note that the 70-foot height provides a lower angle of radiation needed for DX.

A long-wire antenna, several wavelengths long, is primarily a low angle radiator when installed horizontally over a good ground.[4] Its angle of radiation, however, will be lowered even more by choosing a height above ground, as shown in Table II, that favors a lower angle of radiation for the band in question, or by making the long wire longer. From the above you can see that both the directivity and the angle of vertical radiation will change from band to band as electrical length and height change. This does not cause any problems as long as you understand what is happening.

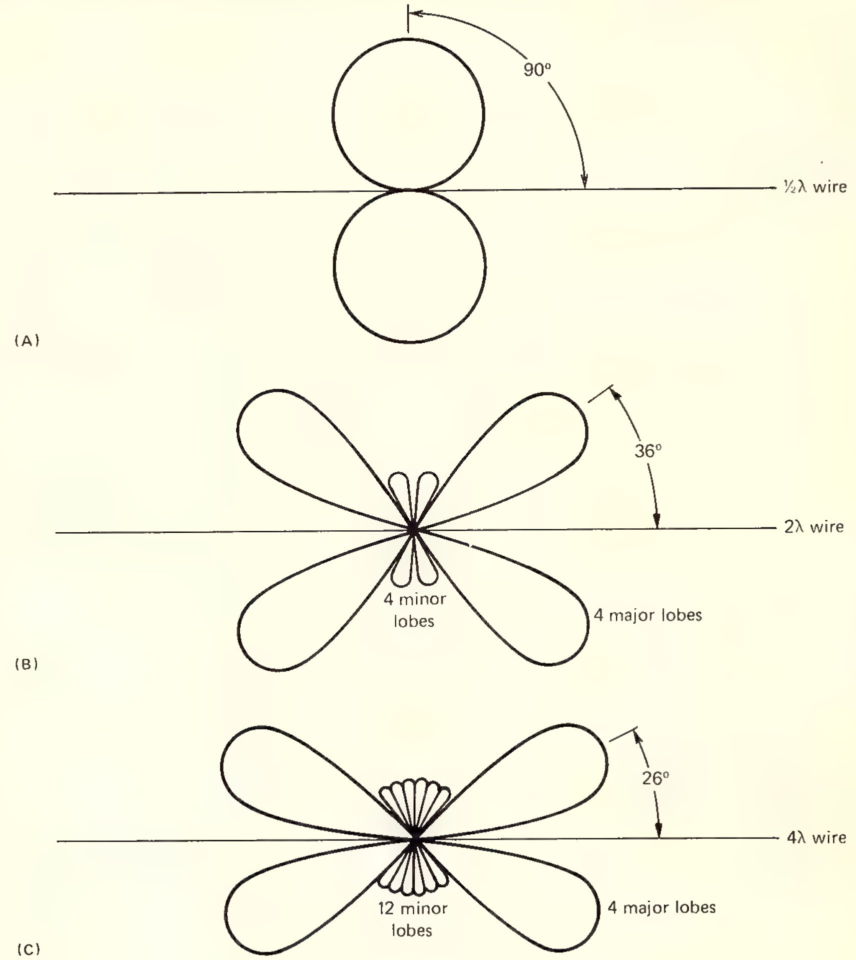

Fig. 1– These are radiation patterns for antennas in free space. (A) A ½-wave dipole, (B) a 2-wavelength long wire, and (C) a 4-wavelength long wire. These patterns were calculated mathematically as explained in the ARRL Antenna Handbook, *page 36, and in footnote #2. What is shown is a slice through the center of the three-dimensional radiation model in a plane containing the wire axis. For example, (A) represents a slice through the center of a doughnut with the antenna wire going through the hole. These diagrams are for center-fed standing-wave antennas.*

Horizontal ½-wave Antenna Above a Perfect Ground

Amateur Band Frequency in MHz	35 feet high: Height in Wavelengths	35 feet high: Vertical Angle of Radiation in Degrees	70 feet high: Height in Wavelengths	70 feet high: Vertical Angle of Radiation in Degrees
1.8	1/16	90	1/8	90
3.5	1/8	90	1/4	90
7.0	1/4	90	1/2	30
10	1/3	45	2/3	25
14	1/2	30	1	15
18	5/8	25	1¼	14
21	3/4	20	1½	10
24	7/8	17	1¾	9
28	1	15	2	8

Table II– The vertical angle of radiation for a half-wave dipole antenna above a perfect ground is shown here for the amateur bands from 1.8 to 28 MHz for physical heights of 35 and 70 feet above ground. The electrical height in wavelengths is also shown.

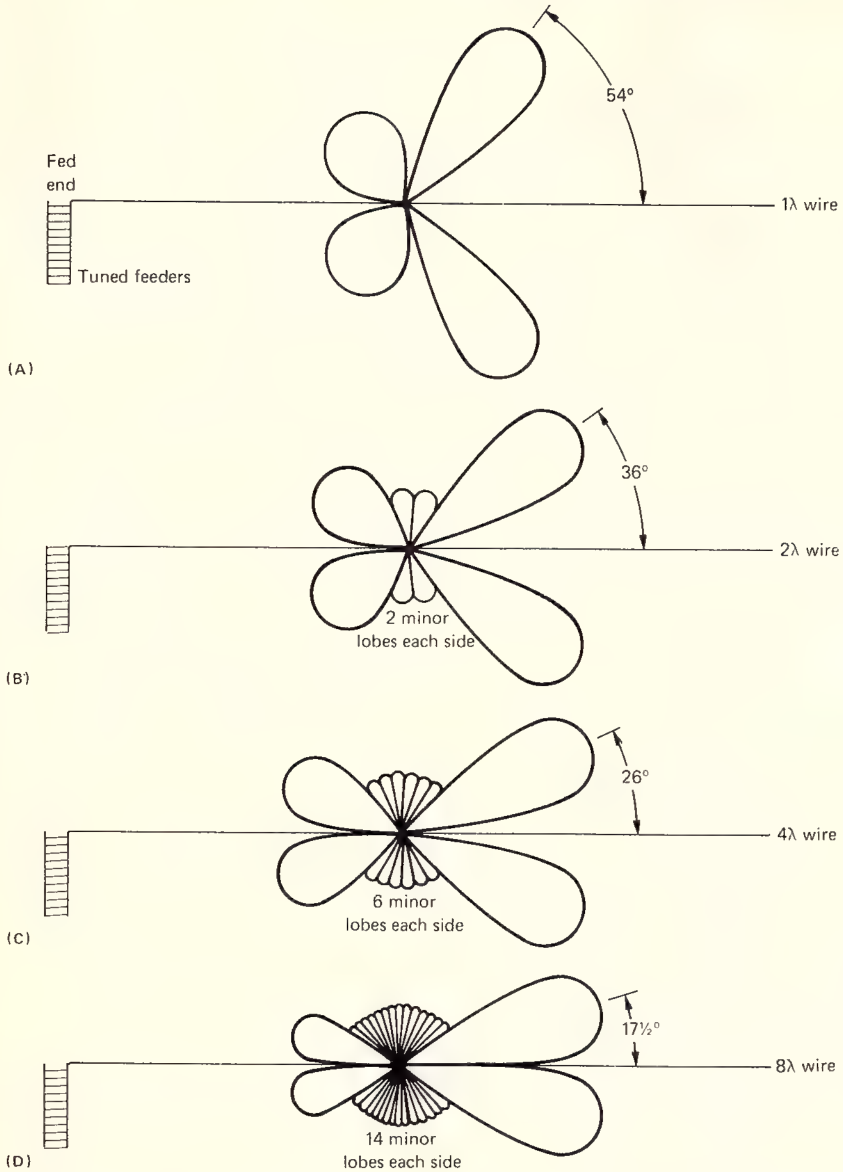

Fig. 2– When a long wire is end-fed, as is usually the case, the radiation losses along the wire cause a substantial traveling wave to exist on the wire, and this causes the directional pattern to become intermediate between that of a pure standing-wave antenna and that of a pure traveling-wave antenna as shown above. This effect makes an end-fed wire semi-bidirectional.

The directional patterns shown in fig. 1 were developed mathematically for a horizontal straight wire in free space with an integral number of half-waves of pure standing wave current distribution on it—for example, a center-fed dipole or other center-fed antenna. When you feed the end of an antenna, this idealized pattern becomes distorted as shown in fig. 2. This is caused by radiation losses as the signal travels from the fed end along the wire to the open end. The signal that is reflected back is less, due to radiation, and therefore produces smaller lobes as shown. If the wire were infinitely long, then there would be no reflected signal and therefore no lobes off the back. An unterminated standing-wave antenna gradually changes into a traveling-wave antenna as the length is increased. An end-fed long wire is not truly bidirectional as many handbooks indicate. The gain is always greatest in the direction away from the feed point.

Major and Minor Lobes

Antenna engineering handbooks tell us that a wire antenna in free space has one lobe for each half wave in its length.[5] A half-wave antenna would have one lobe. Why then does fig. 1(A) show two lobes? To show the radiation pattern in two dimensions on paper, we must take a slice through the three-dimensional model in a plane containing the wire. It's like cutting a doughnut in half and then looking at the cut end. In other words, a three-dimensional model in free space, when reduced to two dimensions on paper, will have two lobes for each half wave in its length. The 8-wavelength antenna, shown in fig. 2(D), will have a total of 32 lobes.

The No. 1 lobe, the one closest to the wire, is always the largest and is called the **major lobe.** The longer the wire in wavelengths, the larger the major lobe, and the smaller the minor lobes. Also the angle between the No. 1 lobe and the wire gets smaller and smaller, approaching but never reaching zero degrees.

The patterns shown in fig. 3 are for traveling-wave antennas. Note that there are no major lobes radiating toward the feed point. Theoretically, all the power reaching the termination resistor has been absorbed, and therefore there should be no pattern to the rear. In practice there is always some radiation in that direction.

Gain

Referring to Table I, Column 3, you will see that the gain of a long-wire antenna varies with its length in wavelengths. The gain approaches 10 dB with a length of 16 wavelengths.[6] This is true whether or not the wire is terminated. The gain of a long wire can be increased by lengthening it or by adding other wires in certain phase relationship. The apparent gain at a distant point can be increased by raising the height of the wire to obtain a lower angle of radiation, more favorable for working DX. Fig. 4(A) shows two 8-wavelength wires connected together with an apex angle of 36 degrees and fed 180 degrees out of phase with a tuned open-wire line. *(For a discussion of open-wire feed line, see Lew McCoy's article elsewhere in this issue—ed.)* This antenna is called a **"V" beam** and will have about 3 dB more gain than a single wire. Another 3 dB of gain can be obtained by arranging two "V" beams back-to-back as shown in fig. 4(B). This antenna is called a **rhombic** or **diamond.** We have chosen not to terminate the rhombic so that it will be semi-bidirectional.[7]

Termination

Converting a standing-wave antenna to a traveling-wave antenna by terminating it in its characteristic impedance only reduces its radiation off the rear without helping the signal off the front. It is a big help, however, in reducing QRM coming in off the back when receiving. The exact value of the terminating resistor for your particular antenna will have to be determined by experiment due to varying height, ground conditions, and nearby surrounding objects. Terman shows a graph giving the radiation resistance of a ½-wave dipole versus an 8-wave horizontal wire for various heights above ground.[8] It looks as though a non-induc-

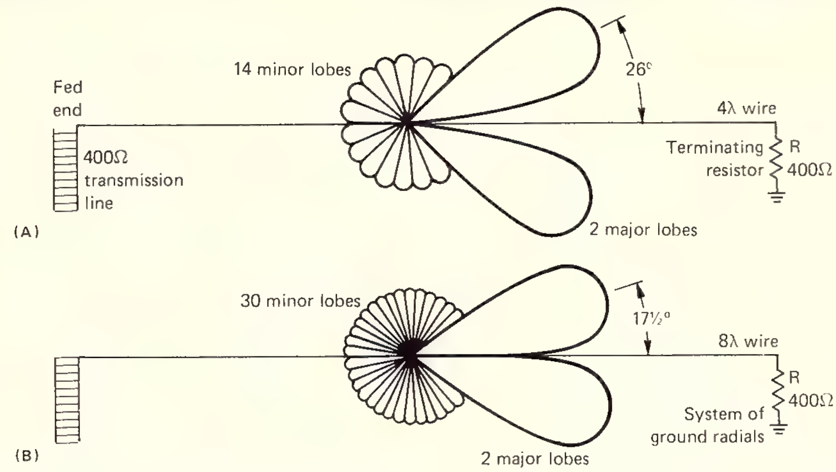

Fig. 3– Radiation patterns for terminated antennas. (A) A 4-wavelength long wire and (B) an 8-wavelength long wire. Both of these antennas are of the traveling-wave type and are essentially unidirectional off the terminated end. The terminating resistor must be non-inductive and capable of dissipating one half of the transmitter's output.

tive resistor of between 150 and 400 ohms might do the job.

A.E. Harper says that the terminating resistor for a 3-wire rhombic varies between 650 and 850 ohms.[9] The reason more amateurs do not use terminated antennas is probably because the resistors are hard to find and expensive. Price a 250-watt 800-ohm non-inductive resistor the next time you go shopping.

To determine experimentally the correct termination for your particular long wire, install a 500-ohm carbon-type variable resistor between the far end of your antenna and the radial ground system that you have put in place out there. Have a friend equipped with a 2-meter handie-talkie turn this pot while you listen to a DX station coming in off the back of the wire. When your "S" meter shows a null, have your friend bring the pot back to the shack and measure it. This will be the value for your terminating resistor.[10] In lieu of an elaborate ground system, you can make an effective ground, for one band only, by connecting your terminating resistor to a ¼ wavelength of wire up in the air. You would cut the antenna ¼ wave from the far end and insert the resistor. The terminated "V" beam in fig. 4(A) uses this idea. The terminating resistor for a single wire is usually about half that of a rhombic.

Designing the Antenna

With the foregoing in mind, let's design one or more long-wire antennas. The formula for calculating the length of a long-wire antenna is as follows:[11]

$$L = \frac{984\,(N - 0.025)}{f}$$

L = wire length in feet.
N = number of wavelengths on the wire.
f = the frequency in MHz.
(N – 0.025) = correction factor for the lack of end effect on all but one ½ wave.

For 160 meters:

$$L = \frac{984(1 - 0.025)}{1.800} = 533 \text{ feet}$$

N = 1
f = 1.800

Let's see how this length compares with the length required for other bands, 80 through 10 meters. If we now solve the above formula for each band using the correct values for **N** and **f** each time, we will get a slightly different length as tabulated in Table III. The average length is 557 feet. We chose 560 feet for the length of our wires because it was exactly right for 10, 15, and 20 meters and close for 40 meters. Since a long wire fed at the end requires an antenna tuner to match it to the 50-ohm output of the modern transmitter, we will use the tuner to bring the long wire to resonance on all the bands.

A drive through the pasture behind the barn in our Jeep indicated that we could put up at least four long wires pointing from northeast through east to south with one end of each supported at the ridgepole of our house. It was decided to support each wire in the center to reduce sag in such a long span. In the interest of holding down expenses, a height of 36 feet, the height of the ridgepole of the house, was chosen for the poles and masts. The four end masts were made of three 12-foot 2 × 4's, while the center poles were made of 1¼-inch TV mast sections. The guy wire was #14 galvanized electric fence wire purchased in ¼-mile spools at the local farm supply dealer. A spool of #18 copper-weld electric fence wire was used for the antennas. (See fig. 5.)

Aiming the Wires

Orienting the wires properly is the most overlooked part of any long-wire installation. For best results the wire must be pointed plus or minus the number of degrees given in Table I, Column 2, from the great-circle bearing of the DX station you wish to work. Never point the wire at the great-circle bearing, because a long-wire antenna has a null directly off its end. Column 2 shows that an 8-wavelength wire has two main lobes 17½ degrees off either side of the wire. The two lobes away from the feed point are stronger, while the two lobes towards the feed point are weaker, as shown in figure 2(D). Now let's assume that you live in northern New England and that you wish to work Europe. Consulting a great-circle map centered on your area will reveal that the true great-circle bearing for central Europe is about 54 degrees from true north.

True North

Where is true north? Do not rely on road maps, city maps, or a survey of your property. At best these will be in magnetic bearings. Find true north by taking the shadow of the sun at noontime. This is all explained in the *ARRL Antenna Handbook.*[12] Simply drive a stake into the ground at the end of the shadow from a vertical pole at exactly noontime. That night, line up the north star, *Polaris,* over

Frequency of Amateur Band	Number of Wavelengths per Band	Length of Wire in Feet	Resonant Frequency for a Wire Length of 560 feet
1.8	1	533	1.713
3.5	2	555	3.470
7.0	4	558	6.985
10*	5½	538	9.620
14	8	560	14.000
18*	10.5	572	18.406
21	12	561	21.042
24*	14	573	24.556
28	16	561	28.070

**New WARC bands.*

Table III– Table III shows the calculated length of a long-wire antenna for each of the amateur bands, 1.8 through 28 MHz, the average length being 557 feet. Column #4 gives the resonant frequency of a wire 560 feet long. This is the length chosen, since our antenna tuner will resonate this wire on each of the bands.

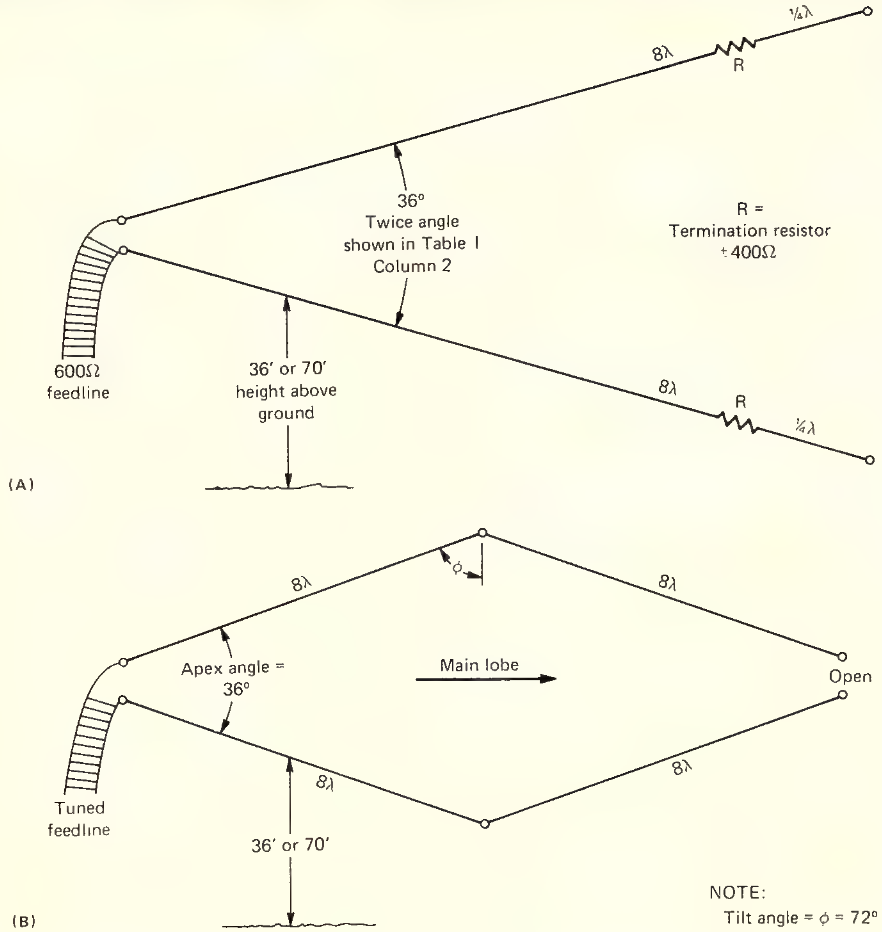

Fig. 4– Illustrated above are two methods of increasing the gain of a long-wire antenna by combining two long wires in a phase relationship. (A) A "V" beam, terminated for one band only by using a ¼-wave piece of wire as an artificial ground. This beam will only be unidirectional on the band for which the wire is ¼ wavelength. (B) An unterminated rhombic antenna is shown. It could be terminated if desired by using a non-inductive resistor of around 800 ohms. The apex angle of 36 degrees is optimum for a leg length of 8 wavelengths. If you try to use it with more than 8 wavelengths per leg, the front lobe will split into two lobes, throwing a null straight ahead. If you want to use more than 8 waves per leg, then the apex angle must be reduced.

the top of the same vertical pole and drop a brick on the ground at your feet. The next day, the brick, pole, and stake should all line up. If so, you now have a true north-south line and may lay out or aim your antennas in the correct directions. With a protractor, measure off the number of degrees you have decided on from your north-south line, put up your poles and masts, and string your antenna wire.

To put a lobe at 54 degrees you may point your 8-wavelength long wire at 36 degrees (54 – 18) or at 72 degrees (54 + 18). The first gives you lobes at 18 and 54 degrees, while the second gives you lobes at 54 and 90 degrees. If you elect not to terminate your wire, you will also have two lobes, maybe an "S" unit or so weaker, 180 degrees in the opposite direction. We chose 72 degrees for our first wire, giving us lobes aimed at Europe and Africa off the front and lobes aimed at New Zealand and Australia off the back.

If, in like manner, you put up three more wires spaced radially 36 degrees apart, you will end up with the beam headings shown in Table IV. Note that wires #1 and #2 may be connected up as a "V" beam pointed at Africa off the front and at Australia off the rear. Similarly, wires #2 and #3, and #3 and #4, may also be used as "V" beams. The above is for the higher frequency bands. On the lower bands try every other wire or the two outside wires as "V"s. The combination that works best on receive usually also works best on transmit.

Antenna Tuner

Most any type of antenna-tuning network or "matchbox" will tune up a long wire for the bands it was designed to cover. For example, a Johnson Viking Matchbox will not tune any antenna on 160 meters or the new WARC bands. My preference is one with a rotary inductor similar to the Heathkit Model SA-2060 shown in fig. 6. This circuit allows you to tune any long wire to any frequency from 1.800 to 30 MHz with a 1:1 s.w.r. Matching the antenna to the 50-ohm output of your transmitter this close is only important if you have a solid-state final amplifier. The 4:1 balun shown is used only when feeding a "V" beam or when using 2-wire feeders. (See fig. 7.)

Static Protection

On a windy day with a highly charged atmosphere, a long-wire antenna will pick up a lot of static electricity—enough voltage to jump a good half inch or more. This will give you quite a jolt if you accidently touch one of the ungrounded wires. The best solution is to install an r.f. choke, similar to that in your final amplifier, between your antenna-tuner single-wire output and ground.

Referring to fig. 6, you will note that most antenna tuners leave the unbalanced output floating above ground, and so on windy days you can hear the click, click, click of the static charge jumping the plates of the output capacitor. A ground is automatically provided by the balun center-tap when feeding a balanced line. Some amateurs mount an automobile spark plug in a weatherproof box between the far end of the antenna and a ground rod. The spacing of the electrodes in the spark plug should be adjusted so that there is no arcing when the transmitter is modulated. A combination of the r.f. choke and the plug might be even better. Probably the best solution would be actually to ground the far end of each long wire to a group of ground rods for d.c. and a group radials for r.f. This would conduct the static directly to ground at a point as far away from the receiver as possible. The antenna tuner would retune the system to resonance. It is planned to try this idea this summer.

Precipitation static sounds like high-speed automobile spark-plug interference that varies as the wind blows highly charged snow flakes or rain drops against your bare wire antenna.[13] This happens to all antennas, but is worse with long wires because of the greater area. The noise you hear is the individual discharge from each snow flake to the bare wire. About the only cure is to use insulated wire for your antenna, which is not always practical. Precipitation static only occurs occasionally and does not affect your transmission. Therefore, the easiest solution is to provide an indoor antenna for receiving during those periods.

Lightning Protection

When properly installed, a long-wire antenna should not be any more of a lightning hazard than your power or telephone lines. They really are long wires! The greatest lightning hazard is an ungrounded TV antenna strapped to your

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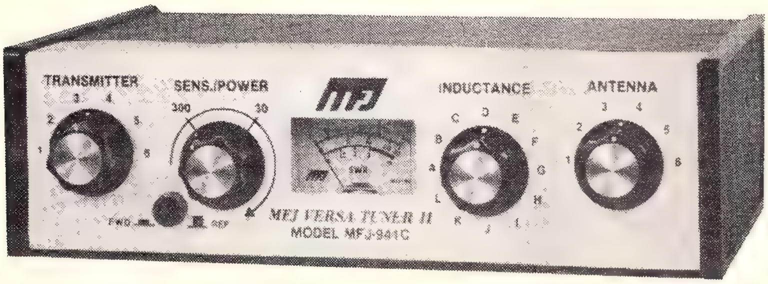

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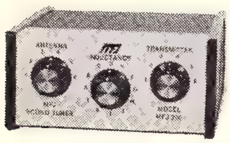
4 Other 300W Models: MFJ-940B, $79.95 (+ $4), like 941C less balun. **MFJ-945, $79.95** (+ $4), like 941C less antenna switch. **MFJ-944, $79.95** (+ $4), like 945, less SWR/Wattmeter, **MFJ-943, $69.95** (+ $4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER



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Use any transceiver, solid-state or tube.

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MFJ-16010, $39.95 (+ $4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B **$139.95** (+ $4)

MFJ's best 300 watt Versa Tuner II.

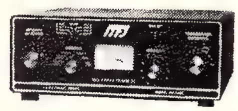
Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III



MFJ-962 **$229.95** (+ $10)

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

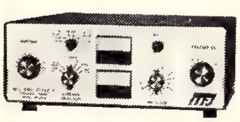
6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $189.95 (+ $10), similar but less SWR/Wattmeter.

MFJ-10, 3 foot coax with connectors, $4.95.

MFJ-984 VERSA TUNER IV



MFJ-984 **$329.95** (+ $10)

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

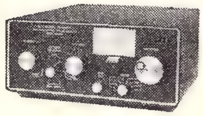
18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $239.95 (+ $10), like 984 less ant. switch, ammeter. **MFJ-982, $239.95** (+ $10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $209.95** (+ $10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V



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3 KW PEP. 250 pf-6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

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Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

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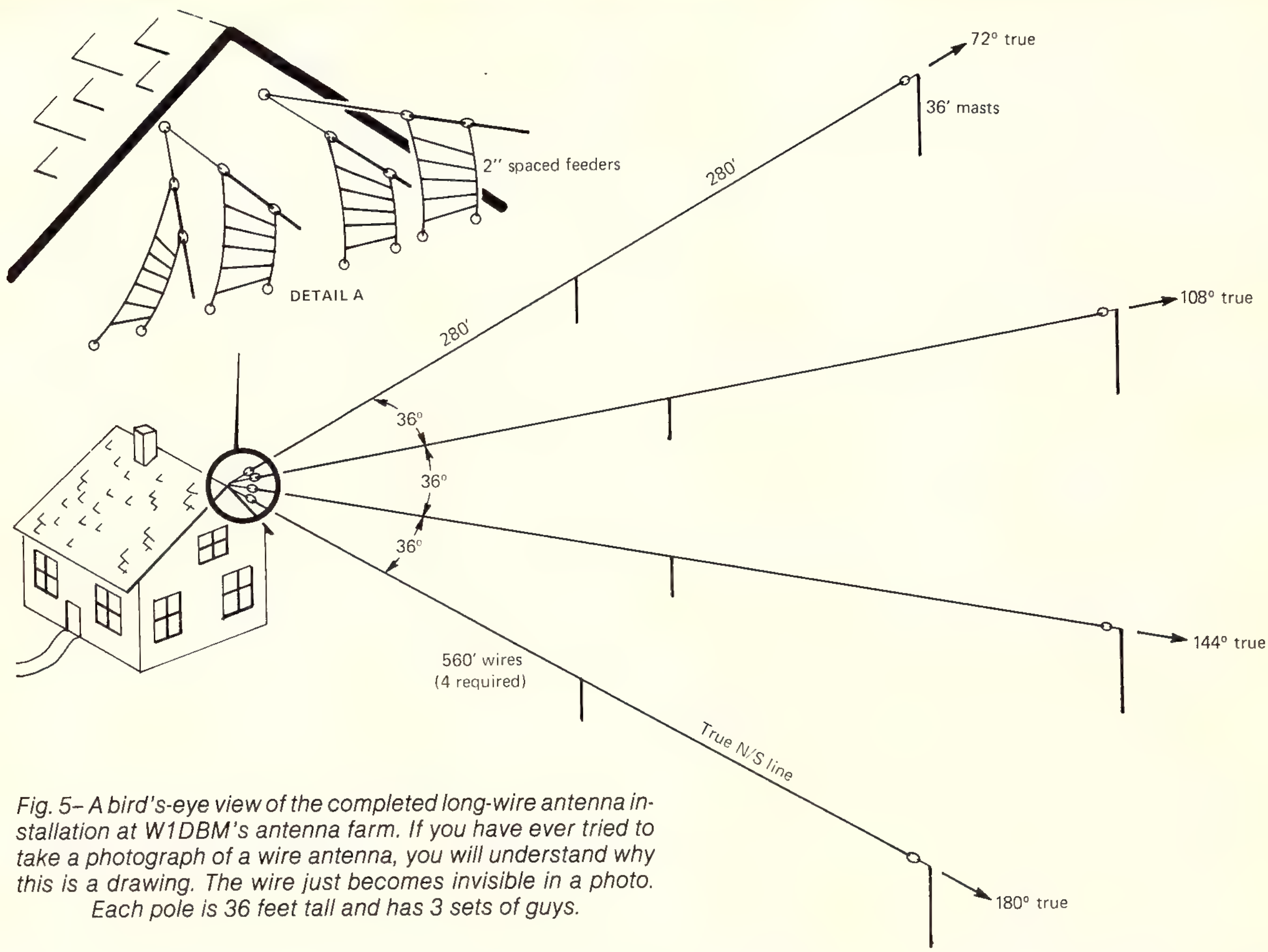

Fig. 5– A bird's-eye view of the completed long-wire antenna installation at W1DBM's antenna farm. If you have ever tried to take a photograph of a wire antenna, you will understand why this is a drawing. The wire just becomes invisible in a photo. Each pole is 36 feet tall and has 3 sets of guys.

chimney. If any antenna system receives a direct lightning hit, a lot of damage can be done to buildings and equipment.[14]

When a highly charged cloud moves over the ground, it attracts an equal and opposite charge in the ground. When the potential difference between the cloud and the ground becomes great enough to jump the air gap, the lightning strikes the nearest object. The amount of damage done is a function of the current squared times the resistance, I^2R. Even though there is not much you can do about a direct hit, you can try to prevent a hit by keeping all your antennas well grounded so that they will leak off the ground charge, thus reducing the potential difference between the cloud and the ground.

You can protect your equipment against voltages induced in your antennas and power line by nearby hits[15] by installing transient protection devices[16] and a very low-resistance ground system. Keep all your antennas grounded at all times except when you are actually using them. When you leave the shack, always disconnect both the power line and antenna from your radio equipment. The above applies to any antenna, not just long wires.

Problems

An end-fed antenna often brings a strong r.f. field into the shack, and therefore may cause an r.f. feedback problem with some rigs. This problem gets worse when the shack is located on the second floor. My ground lead is a piece of ⅜-inch copper tubing 17 feet long. This is like using the top of a 20-meter ground-plane antenna as your ground (some ground!). The r.f. feedback not only caused severe distortion on the audio, but even held the send/receive relay in the send position at times. None of this happened when using dipoles or beams fed with RG/8-U coaxial cable. This feedback problem was solved by taking the following four steps:

1) Detuning the ground by attaching several 17 foot radials and running them around the room at the floor level.[17]

2) Installing a variable inductor in the ground lead ahead of the radials and tuning it for least r.f. in the shack.

3) Installing 40 feet of 2-inch spaced feeders from the antenna tuners to the ends of the antennas up at the ridgepole of the house. This reduced the r.f. field enough in the shack so that most of my other rigs worked with no feedback. One still acted up.

4) Removing the rig from its cabinet

560-foot Wire No.	Orientation of Wire in Degrees from True North	The Two Strongest Lobes Point in Degrees from True North	The Two Weaker Main Lobes Point in Degrees from True North
1	72	54 & 90	234 & 270
2	108	90 & 126	270 & 306
3	144	126 & 162	306 & 342
4	180	162 & 198	342 & 18

Table IV– This arrangement of wires will give strong signals in the following directions in degrees from true north: 18, 54, 90, 126, 162, 198, 234, 270, 306, and 342. We will have available "V" beams with added gain pointing 90, 126, 162, 270, 306, and 342 degrees, all selected with a rotary switch. The above main lobes are for the 20 meter band and will vary by only 4 degrees from 10 through 30 meters. On 40 and 80 meters they will differ by as much as ± 18 degrees.

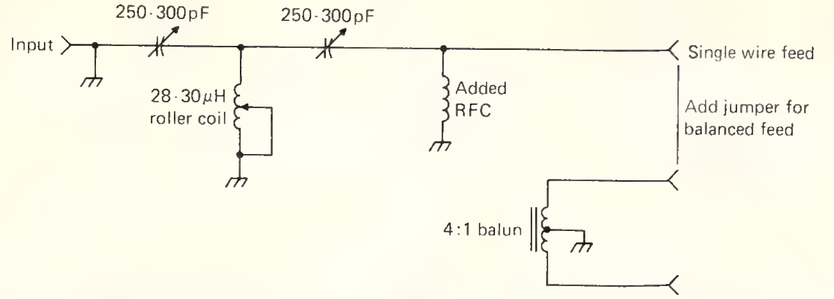

Fig. 6– This is a simplified diagram of the Heathkit model SA-2060 antenna tuner. This unit has a roller-type variable inductor so that you can get an exact 1:1 s.w.r. match between your transmitter and any long wire at any frequency between 1.8 and 30 MHz. This is not possible with some tuners using tapped coils. Note the added rfc to provide a ground for bleeding off static electricity. The jumper between the single-wire feed and the balun is only used with a two-wire feed.

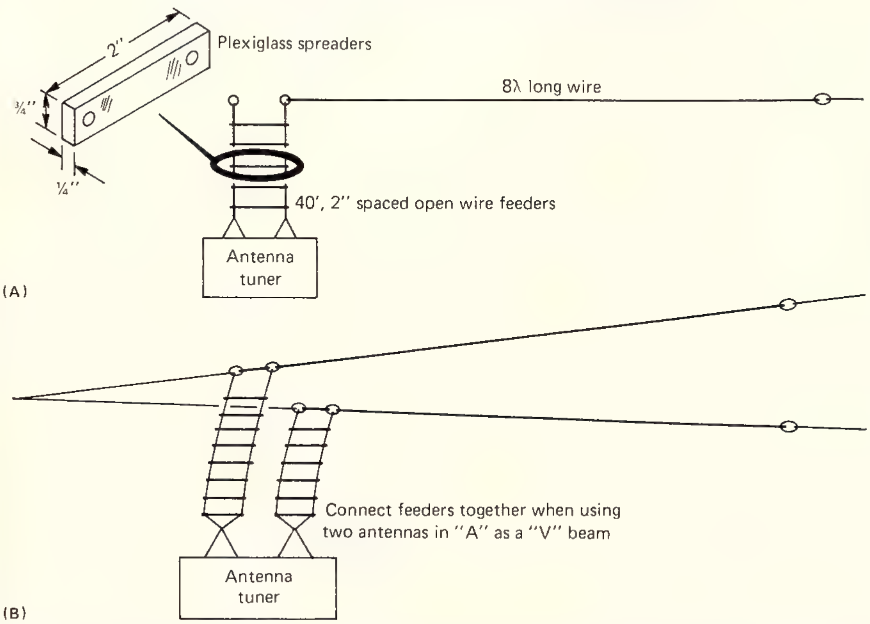

Fig. 7– (A) This illustrates the use of "Zepp" open-wire feeders to reduce the r.f. field in the shack in case of r.f. feedback. To make the spreaders, cut up a piece of ¼-inch thick plexiglass as shown. (B) Each pair of feeders is shorted together at the tuner when feeding a "V" beam as shown.

and installing a 0.01 disc capacitor and a ferrite bead on every lead leaving the chassis. Sounds like t.v.i. in reverse.[18] These included loud speaker, earphones, key, a.c. line, external S/R relay, a.l.c., and any control-voltage lines to an external v.f.o. The shield on the mike cable was floating and had to be grounded to the shell of the mike connector so that it would not conduct r.f. up to the speech amplifier circuit board. The hot mike lead, pin #2 of the connector, required a 200 pF capacitor and a ferrite bead on the end of the 100-ohm resistor. The push-to-talk lead, pin #3, required a 0.01 disc and a ferrite bead.

Results

In general the results are pretty much as you would expect. There are very good signal-strength reports on 160 and 80 meters, although not too much directivity due to the antenna's low height—perhaps an "S" unit or so. On 40 meters the directional characteristics become more noticeable, and the reports on the long wires are always better than on the dipole. The gain on 20 meters and above seems to be higher than Table I, Column 3, would indicate.

For example, K4ETS in Florida reports my signal S9 on my reference antenna and S9 plus 20 dB on the long wire pointing south. When he cuts in the 20 dB attenuation pad, the signal drops to an even S9. This would indicate that the long wire had a gain of 20 dB over the reference antenna on this particular path at this time of day. Table I, Column 3, indicates that an 8-wave long wire should have a gain of only 6.5 dB. On this same north-south longwire, also on 20 meters, KA6JM, in Okinawa, a bearing of 340 degrees, reported S5 on the reference antenna and S9 on the long wire. The same type of reports are received on 10 and 15 meters. On 15 meters ZS6BWF reported L.W. #2 at S6 and the reference antenna at S3. F9OJ reported L.W. #1 at S8 and the reference antenna at S5. On 10 meters ZS6XB reported L.W. #1 at S9 and the reference antenna at S5, while PY5SSA found that L.W. #3 was best by three "S" units.

To make comparisons such as the above, it is necessary to be able to switch antennas quickly. A six-position coaxial switch was installed so that any one of the four long wires or a reference antenna could be switched into circuit between words when transmitting. Each long wire has its own antenna tuner so that all antennas can be tuned up and ready for instant use on any given band. The directivity on the three higher frequency bands seems to be about the same. Table I indicates that there is only a ± 4 degrees from the 30- to the 10-meter bands.

Footnotes

[1] *Radio Antenna Engineering,* A.E. Laport, 1st edition, 1952, p. 197.
[2] *Radio Antenna Engineering,* Laport, p. 304.
[3] *ARRL Antenna Handbook,* 13th edition, p. 58; *Radio Antenna Engineering,* Laport, p. 247.
[4] *ARRL Antenna Handbook,* p. 166.
[5] *Radio Antenna Engineering,* Laport, p. 308.
[6] *Radio Handbook,* W.I. Orr, W6SAI, 19th edition, p. 25.3.
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[9] *Rhombic Antenna Design,* A.E. Harper, 1941, p. 86.
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Experience can sometimes be the best teacher. N1BEP passes along his experience and some nifty ideas on getting that antenna up.

Notes On Towers And Quads

or

"How Do You Get It Up There?"

BY GEORGE W. ALLEN*, N1BEP

After several years off the air and living in different locations, I broke down and bought a Drake TR-7 solid-state transceiver. This was my first experience with output-limited finals. After firing it up, I found that it would receive practically anything, but for output all I could load was a Cantenna. With the classic "wire out the window" it obstinately hung up at 10 watts—10 watts out and 10 watts back! This feature obviously saved the finals from my folly, so I started to put up properly resonant antennas. My yard is full of oaks and maples, and I wound up with wire and rope for multiband dipoles, a "Novice quad" for 40 meters, a bobtail curtain on 10 meters, and other experiments. I also found that I had t.v.i. on almost all channels.

I did manage to work about 30 countries with these improvisions, but always with low signal reports. The neighbors would walk through the yard shaking their heads, and their children tried Tarzan acts on my ropes. All in all, it wasn't the most satisfactory situation.

After a year with this setup, I decided I must break down and get up some kind of beam for 10 and 15 meters. The many articles on quads were glowing enough to convince me to try one. After some planning and searching, I put together a bamboo "birds roost"—a 2-element quad on 10 meters. It was mounted on a 10-foot TV mast section and used a TV rotator. I positioned it on the back deck of the house. Tune-up was made initially with a g.d.o. and then finally by resonating the driven element to the lowest s.w.r. Connection and matching to the 50-ohm feed was made with a quarter-wave matching section of 75-ohm coax (RG59/U). It was necessary to wind the coax into a choke 3 inches in diameter with 6 turns in order to get the s.w.r. down to a reasonable value. The result was an antenna that loaded very well from 28 to 29 MHz, driven directly from the Drake. It gave delightful results when compared to a good dipole.

The bamboo garden stakes lasted just six months before the weather caused them to split and weaken, until one finally broke. Performance also had deteriorated because of corrosion in the connections and coax, which had not been sealed. The results had been so good, however, that my XYL convinced me that I needed a tower and a proper antenna.

I located a twice-used tower with rotator and a kit for a Kirk 2-element 2-band (10–15 meter) quad. The next step was to dig the hole for the tower base next to the house. This seemed to be a never-ending job, doing a little each night after work before the sun set. By the time I poured the concrete and assembled nearly all the paraphernalia for the tower, I regretted that I had ever started this project and sadly missed my initial setup. To not continue would have been to lose face, so my next problem was to get it all up there!

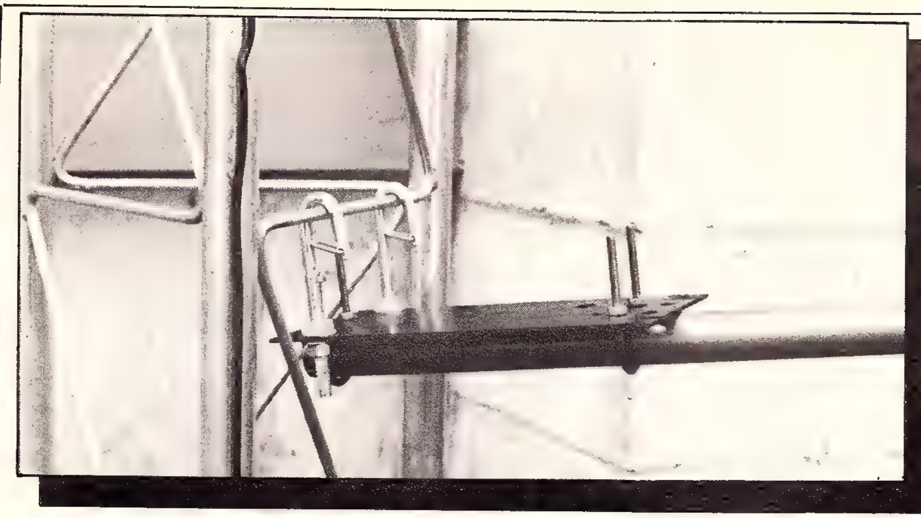
One man can easily raise 20 feet of Rohn 25G tower with a hinged base by "walking it up." Raising a 40-foot tower this way is just too much effort, even with a rope over the house, two 10-foot props, and a strong young man assisting three of us "over-the-hill" types. However, this is the way we hoisted the tower. An easier solution would seem to be to "walk up" the first 20 feet and then assemble the upper sections of the tower with a gin pole as described in *CQ*, May 1977. This is the method I'll use next time.

The tower was fastened to the house with two perforated steel angle braces. A 2 × 4 was fastened under the eaves with lag bolts into the framing of the house to provide a secure attachment for the braces. The tower was then fastened with U-bolts to the braces.

Working platform assembled. Forged hooks were used at the top of the supporting braces, and safety wire was used to secure hooks to the tower crossmember.

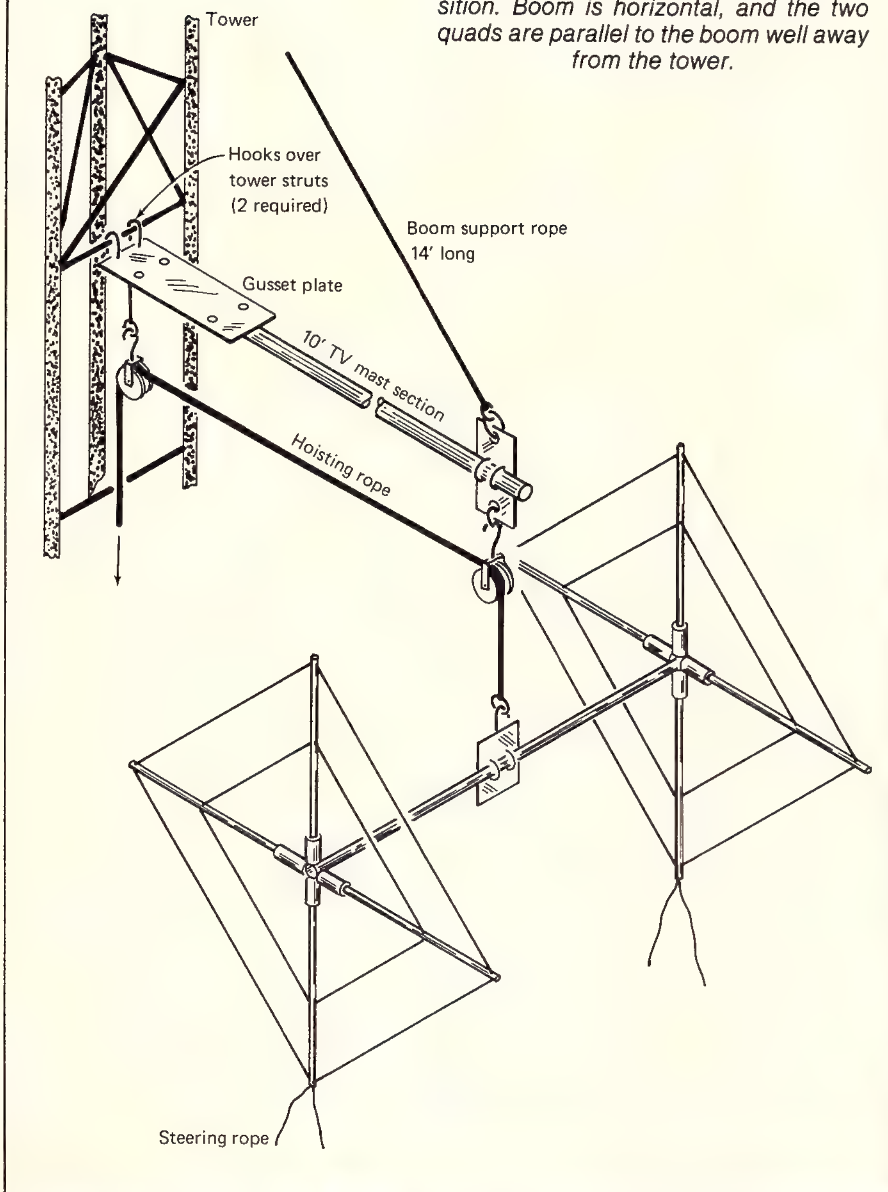
Leveling was done with a long plumb-bob hung on a temporary bracket fastened to the tower at about 20 feet and aimed at a painted target on the base. Standing on a ladder, the tower was shifted back and forth enough to center the plumb-bob while the tower was fastened. Guy wires at the 32-foot level stabilized the top of the tower and were insulated at 6-foot intervals. Two guys were attached to metal straps at each end of the ridge pole of the house, and one guy went to a tree in the backyard. Forged turnbuckles

*Arrowhead Court, Norwalk, CT 06851



Boom attachment to the crossmember of the tower. The hooks allow the boom to be elevated outside the tower. The hooks used in the photo have a safety link so that they cannot disengage from the tower as the boom is elevated.

Fig. 1– Boom and antenna in hoisting position. Boom is horizontal, and the two quads are parallel to the boom well away from the tower.



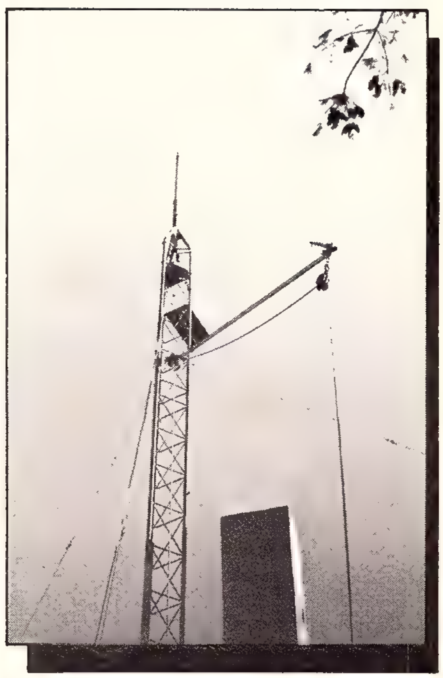
were used to take up the slack in the guy wires.

I learned that standing on the cross braces within a tower while hanging on supporting the body weight is no easy way to work, unless you are accustomed to hanging back in a safety belt, which I'm not. Therefore, a working platform was made as shown in the photo from ½-inch plywood and scraps of the perforated steel angle. The hooks at the top were drilled at the tip and safety wire was passed through so that the hooks could be wired in place temporarily. The suggestion for a working platform was taken from a ham journal article.

This platform worked very well on the tower and was effective in reducing fatigue while mounting the beam. It was also found to be less fatiguing to use a ladder to climb to the first 20-foot level, rather than to climb the whole length of the tower each time.

The 10–15 meter quad has a boom of 6 feet and arms 8½ feet long, so assembly at the top of the tower was not practical. Because of the proximity of the house, guy wires, and trees, the problem "how to get it up?" again arose. The only solution seemed to be a boom to hold the antenna out away from the house and tower, but then how could the antenna be transferred from the end of the boom, which would be out 10 feet from the mast, to the top of the mast? The answer was a boom attached to the tower which elevated by swinging up vertically alongside the tower after the antenna was raised to the end of the boom. This maneuver swung the antenna to the top of the mast.

In order to permit the boom to lift vertically alongside the tower, the hooks used



Boom and working platform in position ready for hoisting the antenna. Ground wire can be seen hanging to the left at the top of the tower.

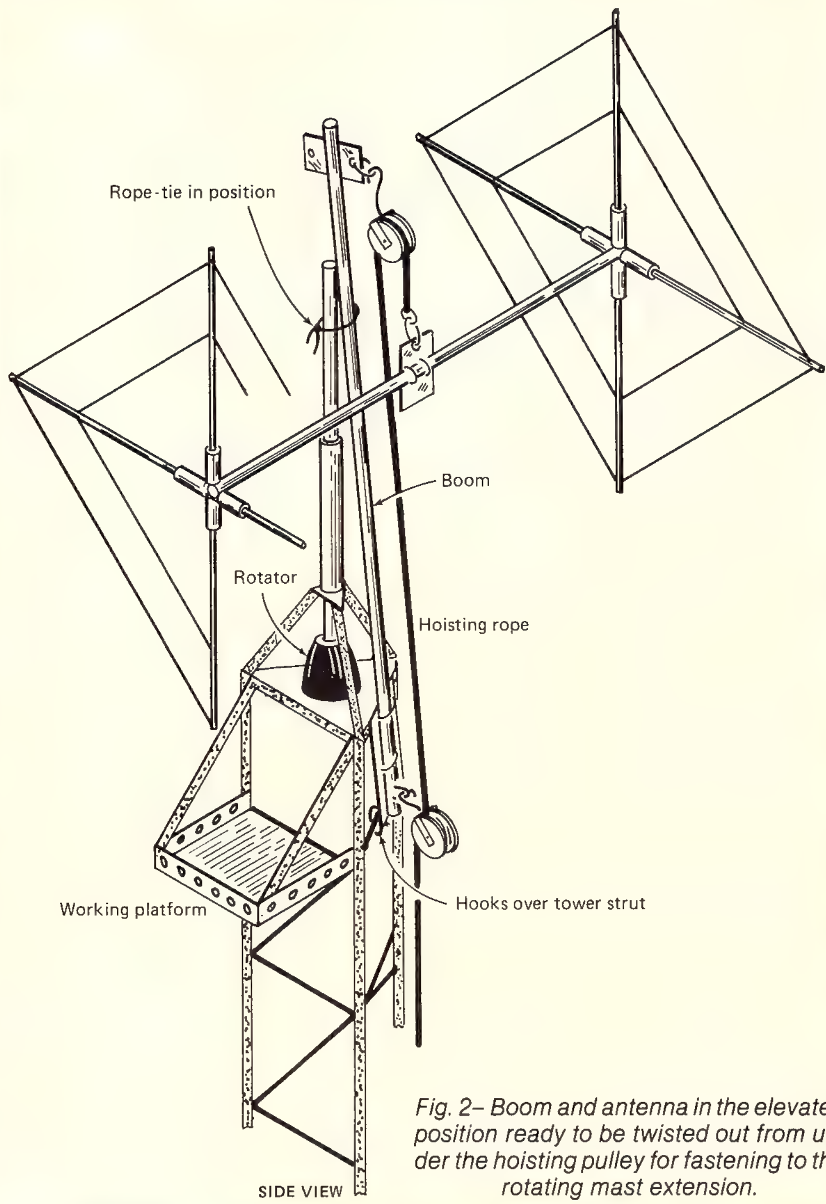


Fig. 2– Boom and antenna in the elevated position ready to be twisted out from under the hoisting pulley for fastening to the rotating mast extension.

to hinge the boom to the tower strut extended about 3 inches so that the boom rested outside the tower struts when raised. This is shown in fig. 1 and the photos. Second, the lifting rope had a second pulley at the inside (tower) end to avoid the need to feed out the lifting rope as the boom was elevated. This also reduced the stress on the end of the boom and minimized the side pull on the tower when lifting the boom.

The drawings and photos show the detail of the boom arrangement, which was rigged from a 10-foot TV mast section and odds and ends of TV mast hardware. A short piece of chain at the end allowed the pulley and lift rope to flex and rotate slightly during the process of lifting the antenna and elevating the boom alongside the tower.

The antenna was completely assembled, and then tuned on the porch, supported on a 10-foot TV mast section. Before mounting, the hardware was given a last check for tightness, and GE Silicone Rubber was used liberally to secure all loose ends. Prepare everything possible in advance on the ground. It's a lot easier than in the air!

The working platform and the boom were installed in one trip up the tower. **Fasten your safety belt before going up the tower!** The lifting rope was threaded through the two pulleys on the boom before hauling up the boom. It was raised with the outboard end upward and hooked onto the tower, so that it extended a little above the top of the rotator mast. When up, the boom support rope was tied to the top of the tower, and then the boom was lowered to the horizontal position in preparation for hoisting the antenna as seen in the photos.

Two light steering lines (¼-inch polypropylene rope) were passed through the bottom quad loops to guide and steer the

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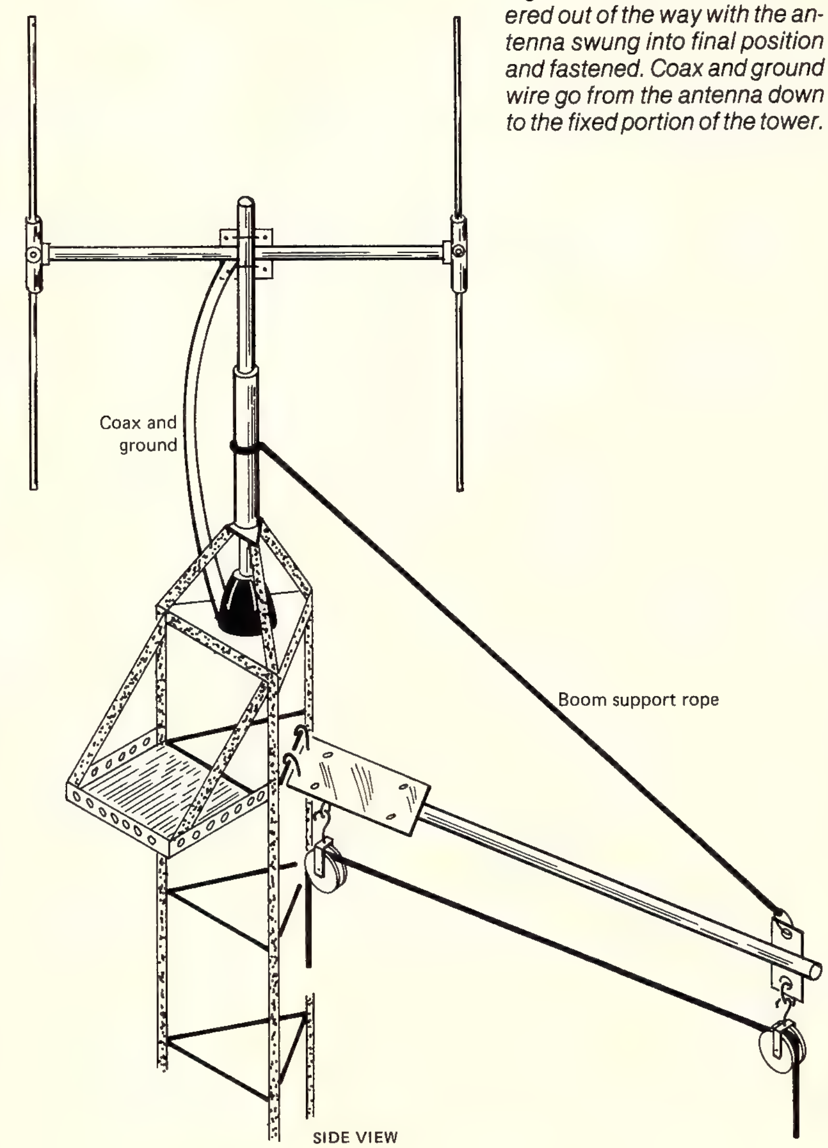
Fig. 3– Boom has been lowered out of the way with the antenna swung into final position and fastened. Coax and ground wire go from the antenna down to the fixed portion of the tower.



antenna through the trees while raising it to the end of the boom. Before hoisting the antenna, I placed the antenna in its sling so that it would hoist and swing into the proper position as the boom was elevated at the top of the mast. This was done so there would be a minimum of manhandling the antenna while standing at the top of the mast.

The antenna rotator had been prepositioned before elevating the tower so that the antenna would be pointed properly when swung into place. I had set the rotator at 330° and raised the antenna at a 60° azimuth so that a 90° turn at the top would make them coincide.

The first stage of raising the antenna was done from the ground with the two quads parallel to the boom. The boom was then elevated while at the top of the tower by pulling up the supporting guy. The antenna swung up and inward to straddle the tower. At this point the antenna was above the guy wires and was then turned 90° to point in the right direction as the rotator had been set. This 90° twist shifted the antenna from under the boom to alongside it for fastening. The supporting hoisting rope and sling twisted enough so that the proper orientation could be made as the U-bolts and shear pin were fastened to secure the beam to the rotating mast extension. The antenna was first fastened loosely to the mast extension, and the boom was lowered. Then the antenna was raised into final position, and the clamps were tightened. During this operation on the tower, my XYL came out on the back porch, looked up at me on the platform, opened her mouth once, and went right back into the house!

All that remained was to tie up the loose ends. I had decided to have the antenna rotation continuous from east to west through north, so the dead spot on the rotator was set at south. As the anten-

Antenna has been swung 90° out from under the boom and is being secured to the rotating mast temporarily to drop the boom before final tightening.

na was mounted, pointing approximately north, I left enough slack in the coax and ground wire so that they would permit a half-turn in either direction. A ground wire had been fastened from the top of the 15-meter quad director down the metal quad spider, and a stranded ground wire had been attached to the center hub of the antenna. This flexible ground consisted of 7 pieces of #14 stranded copper antenna wire twisted together. Heavy electrical ground clamps were used for fasteners on the ground at the hub and at the top of the tower, by-passing the rotator and mast extension.

The coax feed connections were tightened securely, taped with rubber electrical tape, and then overtaped with exterior vinyl electrical tape. The intention was to make air- and water-tight joints over the coax as far as possible. I have no experience with the performance of such weatherproofing, and we'll see how well it stands up.[1] The old quad connections were not protected, and within 6 months the coax braid was badly oxidized 2 feet back under the outer jacket.

Make sure the rotator cable has not been disconnected or broken with all the activity at the top of the mast. It was damaged in my case, and this was only spotted at a last check before going down the tower the last time.

In conclusion, it's mighty nice to turn the rig on, point the rotator toward Europe or the Pacific, and see the signals peak up as the beam swings around! Moreover, I can load about 100 watts from end to end of both 10 and 15 meters. The quad does seem to perform as well as all the articles predict. In retrospect, the whole project was a lot more hard work than I had anticipated and took much more time. Digging the hole for the base was started September 4th, and my first contact with the completed beam was October 25th. The most important thing for me, however, is to know that it's *up there!* CQ

---

[1] *Coax-Seal, a fairly new product, is ideal for these purposes—ed.*

1982

CQ WW 160 DX Contest High Claimed Scores

BY DON McCLENON*, N4IN

Following are the high claimed scores as of April 8, 1982.

C.W.

NP4A	538,835	K7XX	64,560
KV4FZ	384,651	WØAIH	63,562
K3SXA/MM	128,790	W2FJ	63,140
EA2OP	117,941	N8EA	62,000
N4WW	110,880	K6DDO	60,608
UK2PCR	107,650	DK6AS	59,524
G3RPB	106,122	OK1MMW	59,490
PAØHIP	103,936	AA1K	59,136
OZ1LO	103,455	KS8S	59,040
UK2RDX	99,700	OL6BAB/P	58,800
GM3IGW	97,202	W7XR	58,344
N5JJ	93,980	K4CNW	55,800
YU3EF	93,439	LZ1KDP	55,482
W1CF/1	92,550	KH6DX	55,404
K5GO	85,260	IØONU	54,612
IR8ONU	84,788	N4BP	51,840
K3VA/6	81,344	K8US	51,198
GW3NYY	80,934	N5DU	51,200
N4IN	74,550	LA4O	50,886
W1MX	72,800	YU4FRS	50,680
N3AMK	68,492	UK2BCC	50,555
W3TS	68,408	WB8JBM	50,512
WB4URW	67,536	W4TMR	50,160
W9LT	65,604	DKØTU	50,122
YU7BCD	65,468		

S.S.B.

KV4FZ	261,300	W3YOZ	44,352
W8LRL	129,000	AA4MM	42,572
W1CF	127,020	K4PQL	41,764
HH2B	99,216	N4IN	41,664
WA2SPL	93,080	N5JB	41,664
W7FG	79,884	W3TS	40,920
N3AMK	75,480	WAØTKJ	38,720
K8US	70,224	IR8ONU	37,925
WB8JBM	69,600	WØCM	37,278
WA5WKO	69,120	K6HNZ	36,608
N4WW	66,170	KK9A	36,570
N7DF	62,748	WB7FDQ	34,874
W9UP	61,256	N4ARO	33,800
KC8P	55,974	W2FJ	33,512
WB8PAT	54,908	W9RE	33,182
K2BQ	51,802	KB8HW	31,850
W9AZ	49,648	YV3AZC	31,794
KC4OV	48,564	K5UR	31,552
K3SXA/MM	48,360	KAØHIG	31,058
KØUK	47,200	N4MM	30,634
N4AYO	47,100	VE1YX	28,254
W8IMZ	46,970	WB9LSR	27,730
W4CN	46,534	LZ1KDP	26,565
K1MNS	44,912	KH6KV	23,970

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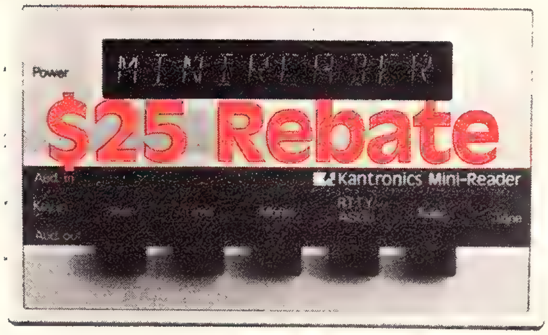

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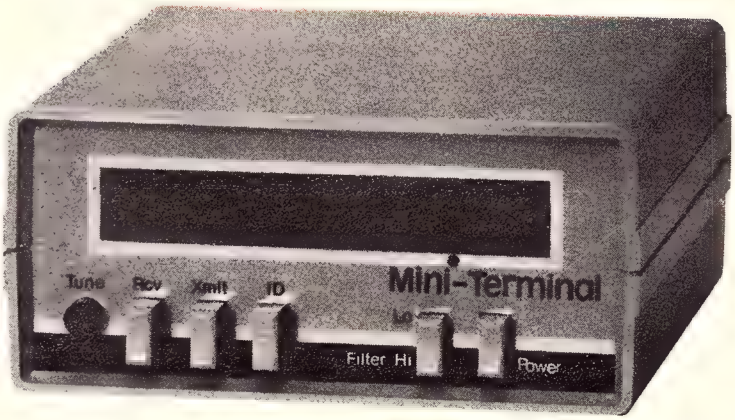

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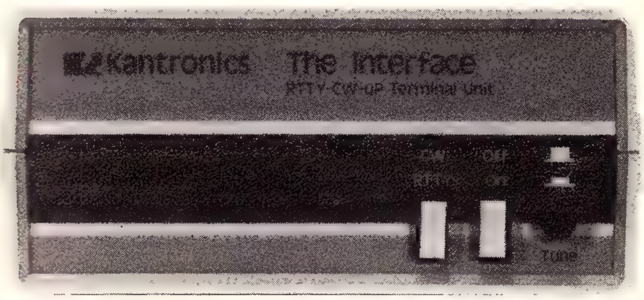

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A Tree-Mounted Vertical Yagi Array

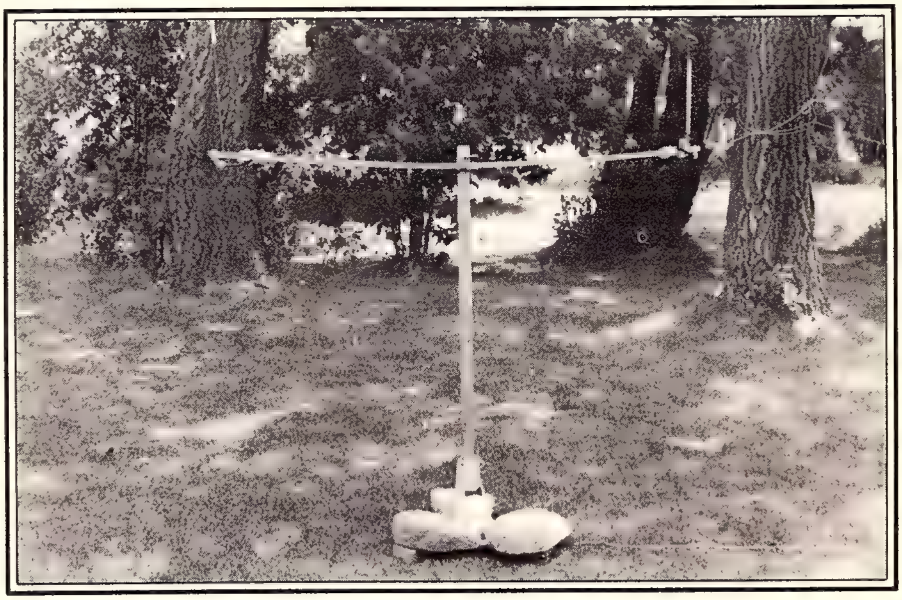
BY EDWARD PETER SWYNAR*, VE3CUI

A majority of would-be, and indeed, established, DXers are laboring under the misconception that a tall tower is the *first* order of the day in the pursuit of their quarry. It is my contention, however, that an effective, rotatable, gain-type of antenna *is* available to the radio amateur on the high-frequency bands, despite the absence of the proverbial home-grown 75-foot high steel "sky hook." Indeed, you may already have on hand several respectably tall "organic towers" on your property without even realizing it. The "organic towers" referred to in this instance are, of course, trees.

The notion of using trees to support a rotatable antenna was lost even to me until just recently. With no tower at VE3CUI, DXing on 20 meters was attained via a home-brewed, ¼-wave, roof-mounted aluminum vertical (this inspite of a half-dozen 60-foot high trees in the backyard). The vertically polarized wave pattern of this small antenna proved to be so effective that I, perhaps paradoxically (but *not* to another amateur!), elected to improve upon the system such that gain and controlled directivity might be achieved. Somehow, the graceful silver birches would have to figure into this plan. It was finally concluded that these trees should be more than just *seen* to be appreciated.

At this point inspiration as to the logistics for a tree-mounted antenna struck from a most unlikely source—specifically, CB radio. A large number of local 11-meter operators employ *vertically-mounted Yagis* (and a large number of them are known to work, albeit illegally, "skip" stations). Why not, then, carry-over this idea of a "lopped-over" beam into legitimate DXing on the amateur radio bands? The idea of the tree-mounted, vertically-polarized, 20-meter, rotatable Yagi was thus born.

*48 Evergreen Drive, Whitby, Ontario L1N 6N6 Canada



A close-up view of the rotor sub-assembly and bottom spreader of the array. Details are explained in the text. The supporting anchor tree is visible in the rear, right-hand side of this photograph.

Description

As can be seen in fig. 1, the antenna consists of a vertically-mounted driven element with one director, both elements being constructed from ordinary copper antenna wire. The length of the driven element is calculated from the "standard" formula for ½-wave dipoles, specifically:

$$\text{Length (feet)} = \frac{468}{\text{Frequency (MHz)}}$$

With a design frequency of 14.1 MHz, one attains a driven element length of

$$\frac{468}{14.1} = 32.7', \text{ or } 32'8''$$

The director, however, must be 6% shorter than the driven element, or, in this particular case,

$$32.7' \times 0.94 = 30.7', \text{ or } 30'8''$$

As outlined in the various antenna handbooks, optimum spacing in terms of gain and front-to-back ratio between the two elements of a *director*-type Yagi occurs at 0.1 wavelength. The prospective builder is cautioned to bear in mind that this particular wavelength distance is in terms of *free space;* it does not refer to wavelength from the standpoint of r.f. flowing on a *wire*, so a "free-space" formula is used, *i.e.:*

$$\frac{984}{\text{Frequency (MHz)}} = \text{Free-space length, (ft.) of a full wave}$$

Again, with 14.1 MHz, this would be

$$\frac{984}{14.1} = 69.7', \text{ or } 69'8''$$

The 0.1 wavelength spacing is obtained simply by multiplying the full wavelength by 0.1, yielding

$$69.7 \times 0.1 = 6.97', \text{ or } 6'11''$$

Two 1″ × 1″ × 7′ long sprucewood spreaders are employed to maintain the proper distance between the elements (when mounting the wires to the spread-

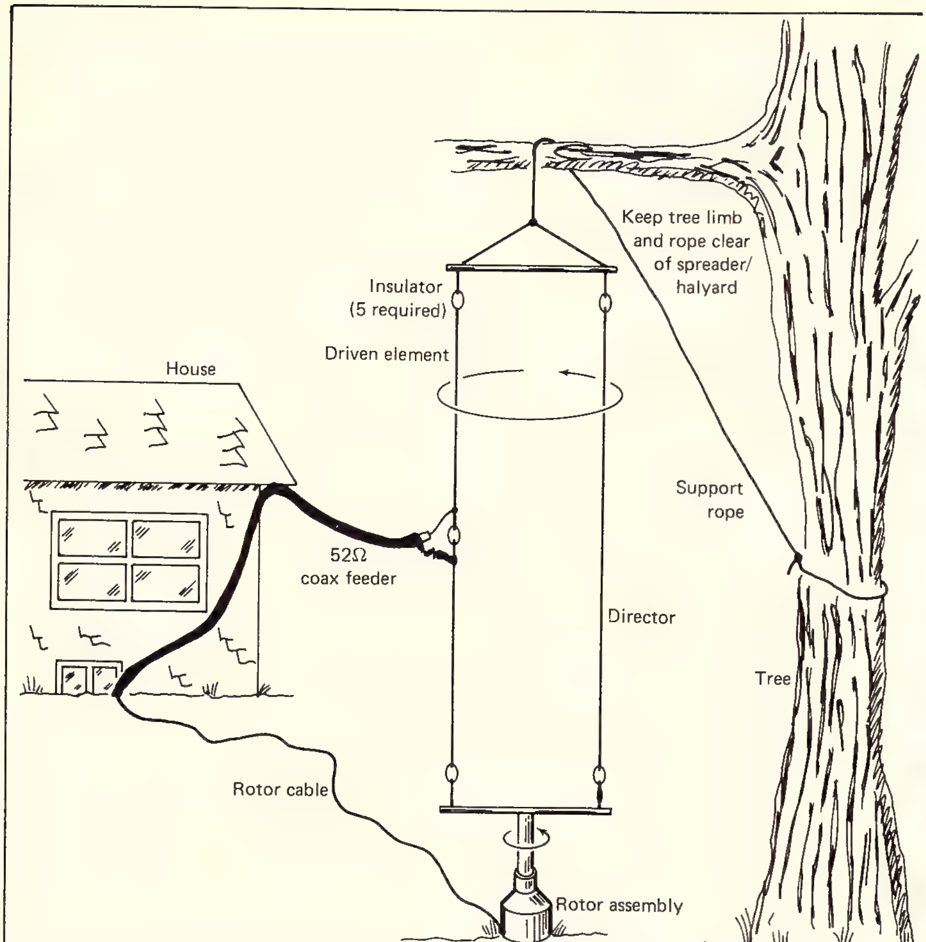


Fig. 1– Individual installations will vary, of course, but this illustrates the setup at VE3CUI (refer to text for specifics). As can be seen, I opted for a director-type second element as opposed to a reflector; the latter would have resulted in slightly less gain and considerably longer element spacing with its 0.15-wave optimum separation.

ers, care should be taken to "center" the director relative to the driven element). A hammock-type support of polypropylene rope is tied to the ends of the top spreader; it in turn is fastened to the support rope which must be long enough (and strong enough) to be slung over an available horizontal tree limb, and reach down for anchoring to the tree's trunk near ground level. Polypropylene line was used at this QTH because of its durability and apparent immunity to water and stretching.

Light-duty rotors serve well with this antenna because, unlike conventional systems, little or no downward thrust on the rotor mechanism is experienced; the tree limb "halyard" bears most of the Yagi's weight, which is practically negligible anyway. The rotor is secured to a triangular steel mounting plate, and this in turn is placed atop three bricks over the ground, one at each corner of the plate (the slight elevation presented by the bricks ensures that moisture from dew and rainfall will not seep into the rotor from the bottom). To anchor the rotor and plate assembly, three large rocks are simply placed on top of the mounting plate. A 4-foot long section of 1″ × 2″ wood extends from the rotor, and is attached to the bottom antenna spreader (in this case, by a single "U" clamp).

The antenna is fed with 52-ohm coaxial cable, the braid of the line being connected to the *bottom* half of the driven element. It is desirable to run the cable away from the array such that the feedline is roughly perpendicular to the vertical plane of the elements. The close proximity of the house to the beam at this QTH served nicely in this instance, as evidenced from fig. 1. You are cautioned when supporting the feedline to leave enough slack in the cable such that it cannot hamper antenna travel, or twist itself about the elements in any way while the system is rotated.

I elected to employ type RG8U coaxial cable in my installation simply because it was on hand; the use of the lighter RG58U-type feeder is recommended (provided power levels will not exceed 500 watts) from the standpoint that element twisting will be minimized whenever the antenna beams in directions out-of-plane with the coaxial cable tie-point-to-support structure. Full 360° coverage is not quite attainable with either type of feeder, however (the antenna should not be rotated to the point that the feedline physically touches the director). Still, this is small hardship considering that the main lobe of radiation, while directive, is certainly

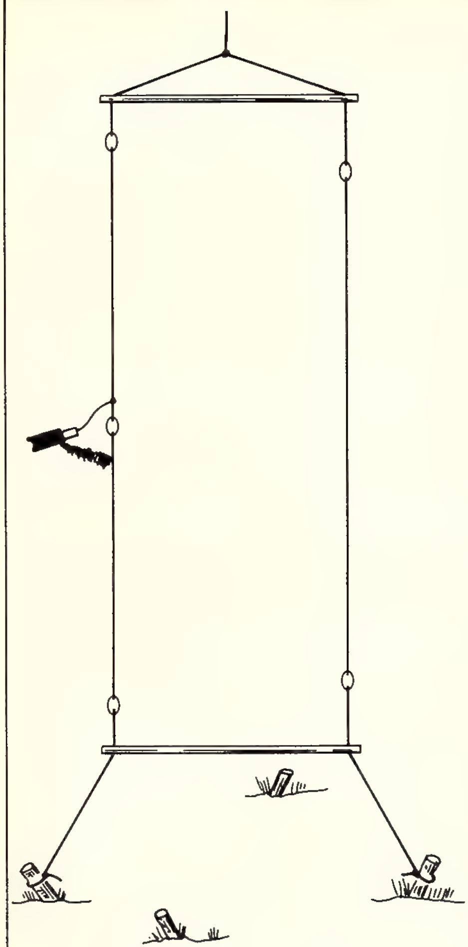


Fig. 2– Alternate installation of the beam—without the use of a rotor—is illustrated above. The antenna may be left in a fixed position, or rotated via the "armstrong" method using additional anchoring rods, per heading desired.

broad enough to provide more than adequate coverage on a global scale.

Again, with either type of coax, it is imperative that the antenna be kept *taut* by the support rope both to minimize flexing of the elements in the wind, and to prevent the array from twisting whenever it is rotated.

Results

As can be seen from fig. 3, the tree-mounted vertical Yagi array is a fairly broad-banded affair. Note, however, that should the "direct-feed" (as opposed to "transmatch-feed") approach be taken, the "purist" may well be required—as with any other antenna—to prune or lengthen the driven element to his/her specific taste as far as s.w.r. is concerned. It may be worth mentioning that trimming/lengthening operations have never been performed upon the *director* element at this QTH.

The antenna exhibits definite front-to-back and front-to-side effects both on receive and transmit (a first-time rotatable beam antenna owner may well find such phenomenons to be quite novel and

Frequency (MHz)	Driven Element Length	Director Length	Director Spacing	*or*	Reflector Length	Reflector Spacing
7.05	66'5"	62'5"	13'11"		70'5"	20'11"
7.20	65'0"	61'1"	13'8"		68'11"	20'6"
14.05	33'4"	31'4"	7'0"		35'4"	10'6"
14.20	32'11"	30'11"	6'11"		34'11"	10'5"
21.05	22'3"	20'11"	4'8"		23'7"	7'0"
21.20	22'0"	20'8"	4'7"		23'4"	6'11"
28.05	16'8"	15'8"	3'6"		17'8"	5'3"
28.60	16'4"	15'4"	3'5"		17'4"	5'2"

Table I– Suggested dimensions for c.w. and phone frequencies on four bands. Dimensions for a reflector-*type Yagi are shown for the benefit of those builders who might desire the improved front-to-back ratio which comes with this type of construction. Lengths for frequencies other than those listed can be calculated from information contained in the text.*

amazing!). Many tests were performed with amateurs throughout the world in this regard. These perhaps can best be exemplified by the following short summary of reports received from stations on three different path lengths on a "typical" day:

Station/Distance	Report Rcvd (from most favored heading)	Report Rcvd (from most favored heading)
VE3/Ground-wave	S-9 + 20 dB	S-9
VP2/Short-Moderate	S-9 + 10 dB	S-8
VK3/Long	S-9	S-4

On-the-air reactions to the tree-mounted vertical Yagi array have been most favorable and encouraging, to say the least. The vast majority of amateurs contacted had never before heard of h.f. *vertical* Yagis, let alone used one in their DXing activities. Comments such as, "You're one of the strongest signals on the band," are not uncommon, especially from "long-haul" DX stations. Indeed, the supreme compliment to this antenna system came recently from a VK operator who stated that VE3CUI was the *sole* "readability-5" Canadian signal making the path to his QTH so late at night, his local time.

The antenna is surely worth the very little effort and money expended upon its

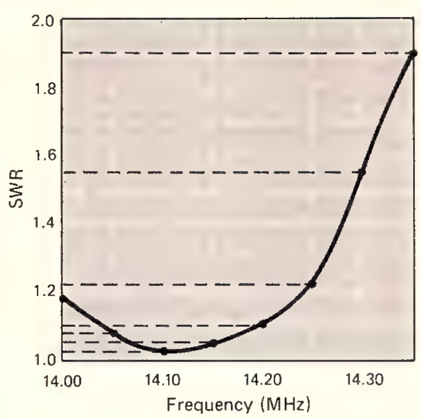


Fig. 3– Plotted s.w.r. curve of the text antenna. S.w.r. match to a ratio of one is listed vertically on the left and right sides of the graph; frequency, in MHz, is displayed horizontally along the bottom (ex., s.w.r. at 14.20 MHz is 1.1:1).

erection. Cash outlay can be reduced even further by eliminating the rotor, per fig. 2. In either case, the builder will find the vertical Yagi to be a formidable contender in the pileups. The new countries worked by VE3CUI (TU9, EA9, T30, H44, YB8, KG6, FO8, FK8) while using the system attest to this fact.

Some Concluding Remarks

Several precautionary notes with regard to safety are in order. Because they are at high r.f. voltage potential, it is essential to keep the bottom ends of the array away from the carefree hands of neighborhood children (and adults, for that matter). The best way to ensure against potential accidents in this regard is simply to keep the bottom of the antenna as high above ground as possible. Barring this, I recommend that well-insulated wire be used for the elements (with no exposed radiator lengths at the bottom) in conjunction with a warning sign(s) attached to the bottom wood spreader.

You should also be prepared to tolerate the inquisitive nature of your neighbors during the process of erecting the tree-mounted vertical Yagi array. One particular chap next door was overheard commenting with bemusement on the "oil drilling rig" taking shape in the yard of VE3CUI. It was later learned, much to my delight, that this neighbor received his just desserts at 3:15 the following morning when he was rudely awakened by his startled wife exclaiming that a U.F.O. had landed in their backyard! (In actual fact, I was quite innocently rotating my beam for an optimum South Pacific heading at the time.)

I sincerely hope that those amateurs in the world who may now be grieving over the lack of a tower in their possession will take heart and attempt to turn such apparent misfortune into success, either with the aid of this brief paper, or through their own imaginative abilities. Bear in mind that DXCC does not of necessity have to carry the postscript "Tower Manufactured By . . . ." Let *nature* take its course, in more ways than one, and forever may you seek new DX thrills on the bands "under the old oak tree."

Here are some important facts about grounds for your station and antenna system. Did you know that doubling the rod length reduces resistance by about 40%?

EFFECTIVE GROUNDS

BY JOE HYPNAROWSKI*, WA6VNR

Good grounds are an important part of any station and antenna system. If you are seriously interested in low-band operation—40, 80, and especially 160 meters—the more you know about grounds the better off you are. Good grounds are also important to you folks who live in lightning-prone areas. Now what about grounds?

Recently, there was an article on measurement of ground resistivity in one of the amateur magazine. Fine article! But what do you do if you are not happy with high resistivity ground? No, don't move. Not yet anyway. I researched this subject of improvement of ground resistivity at length and have come up with several interesting points which I'd like to present here. Of course, you can always go with a counterpoise, but that's an entirely different subject which I will not delve into.

As near as I can determine after my research into this earthy subject, there are three major variable conditions which affect earth resistance. These are:

1. Local Earth Resistivity
2. Length and Type of Rod
3. Diameter and Quantity of Rods, or Electrodes

Local Earth Resistivity

Type of Soil. The type of soil affects resistivity, and although you can't move away easily, you might consider soil a factor when looking for that perfect QTH. Whether a soil is largely clay or very sandy, for example, can change earth resistivity considerably. It isn't easy to define exactly a given soil; clay can cover a wide range of soils. Therefore, we can't say that any given soil has a resistivity of so many ohm-cm. Tables I and II, from two different reference books, show the wide range of values. Also note the spread of values for the same general types of soils. (See fig. 1.)

Effect of Moisture/Salts on Resistivity. In soil, conduction of current is largely electrolytic. Therefore, the amount of moisture and the salt content of soil radically affect its resistivity. The amount of water in soil varies, of course, with the weather, time of year, nature of sub-soil, and depth of the permanent water table. Table III shows typical effects of water in soil. Note that when dry the two types of soil are good insulators (resistivities greater than 1000×10^6 ohm-cm). With a moisture content of 15%, however, note the drastic decrease in resistivity (by a factor of about 100,000).

Actually, pure water has an infinitely high resistivity. Naturally occurring salts in the earth, dissolved in water, lower the re-

SOIL	RESISTIVITY OHM-CM		
	AVERAGE	MIN.	MAX.
Fills—ashes, cinders, brine wastes	2,370	590	7,000
Clay, shale, gumbo, loam	4,060	340	16,300
Same—with varying proportions of sand and gravel	15,800	1,020	135,000
Gravel, sand, stones, with little clay or loam	94,000	59,000	458,000

Table I– Resistivities of different soils. (Source: U.S. Bureau of Standards Technical Report 108.)

SOIL	RESISTIVITY, OHM-CM (RANGE)
Surface soils, loam, etc.	100 — 5,000
Clay	200 — 10,000
Sand and gravel	5,000 — 100,000
Surface limestone	10,000 — 1,000,000
Limestones	500 — 400,000
Shales	500 — 10,000
Sandstone	2,000 — 200,000
Granites, basalts, etc.	100,000
Decomposed gneisses	5,000 — 50,000
Slates, etc.	1,000 — 10,000

Table II– Resistivities of different soils. (Source: Evershed and Vignoles Bulletin 245.)

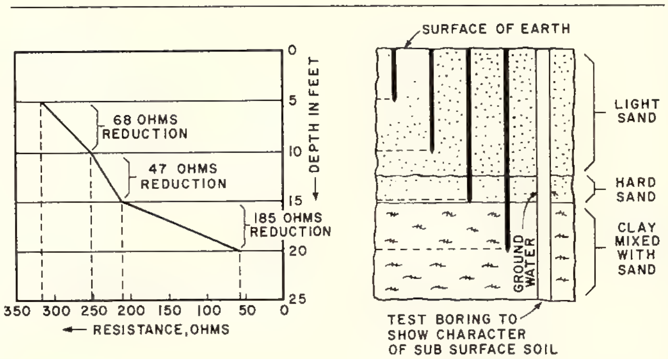


Fig. 1– Deeper earth electrodes lower the resistance. These graphs show the relation between character of soil and resistance of driven electrode at increased depths.

*3785 Mt. Blackburn Ave., San Diego, CA 92111

MOISTURE CONTENT, % BY WEIGHT	RESISTIVITY, OHM-CM	
	TOP SOIL	SANDY LOAM
0	$1,000 \times 10^6$	$1,000 \times 10^6$
2.5	250,000	150,000
5	165,000	43,000
10	53,000	18,500
15	1,000	10,500
20	12,000	6,300
30	6,400	4,200

Table III– Effect of moisture content on earth resistivity. (Source: "An Investigation of Earthing Resistance," by P.J. Higgs, IEEE Journal, *vol. 68, p. 736, February 1930.)*

ADDED SALT % BY WEIGHT OF MOISTURE	RESISTIVITY, OHM-CM
0	10,700
0.1	1,800
1.0	460
5	190
10	130
20	100

* For sandy loam—moisture content, 15% by weight; temperature, 17°C (63°F).

*Table IV– Effect of salt content on earth resistivity.**

TEMPERATURE		RESISTIVITY, OHM-CM
C	F	
20	68	7,200
10	50	9,900
0	32 (water)	13,800
0	32 (ice)	30,000
−5	23	79,000
−15	14	330,000

*For sandy loam, 15.2% moisture.

*Table V– Effect of temperature on earth resistivity.**

sistivity. Only a small amount of salt can reduce earth resistivity quite a bit. (See Table IV.) The term *salt* does not mean just the kind you use to season food (sodium chloride), although this type of salt can occur in the soil. Other kinds include copper sulphate and sodium carbonate.

Effects of Temperature on Earth Resistivity. Not much information has been found or collected on the effects of temperature on earth resistivity. Two facts lead to the logical conclusion that an increase in temperature will decrease resistivity: (1) water present in soil mostly determines the resistivity, and (2) an increase in temperature markedly decreases the resistivity of water. The results shown in Table V confirm this. Note that when water in the soil freezes, the resistivity jumps appreciably; ice has a high resistivity. Not too "cool" for those of you in the Northeast. Note also that the resistivity continues to increase as temperatures go below freezing. You could have a really lossy ground value at the North Pole! From Table V, note that a 54-degree drop in temperature (from 68°F to 14°F) causes almost a 50-fold increase in resistivity. Really severe winters have good propagation on the low bands—just when you need the good low resistivity! Oh well, sometimes you just can't win.

Seasonal Variations in Earth Resistivity. We have seen the effects of temperature, moisture, and salt content upon earth resistivity. It makes sense, therefore, that the resistivity of soil will vary considerably at different times of the year. This is particularly true in locations where there are more extremes of temperature, rainfall, dry spells, and other seasonal variations. The curves in fig. 2 illustrate several worthwhile points. They show the expected change in earth resistance (due to resistivity changes) over a 1½ year period. They also show that the deeper electrode gives a more stable and lower value. We conclude that the moisture content and temperature of the soil become more stable at greater distances below the earth's surface. Therefore, the earth electrode (ground rod) should reach a deep enough level to provide (1) permanent moisture content, relatively speaking, and (2) constant temperature—below the frost line, again relatively speaking.

Improving Earth Resistance

Length and Type of Rod. Generally speaking, copper is the best rod material. This may be a problem for those of us who don't want to waste money on shoving pure copper rods into the backyard. However, commercially available electric-company-type ground rods are steel copper covered. This will work just as well and will be easy on the pocketbook.

Effect of Rod Size. As you might suspect, driving a longer rod deeper into the earth materially decreases its resistance. In general, *doubling the rod length reduces resistance by about 40%*. The curve of fig. 3 shows this effect. For example, note that a rod driven 2 feet down has a resistance of 88 ohms; the same rod driven 4 feet down has a resistance of about 50 ohms. Using the 40% reduction rule, $88 \times 0.4 = 35$ ohms reduction. A 4-foot rod by this calculation would have a resistance of $88 - 35$, or 53 ohms, comparing closely with the curve values.

Diameter of Rods and Use of Multiple Rod Systems

Diameter. You might also think that increasing the electrode diameter would lower the resistance. It does, but only a little. For the same depth, doubling the rod's diameter reduces the

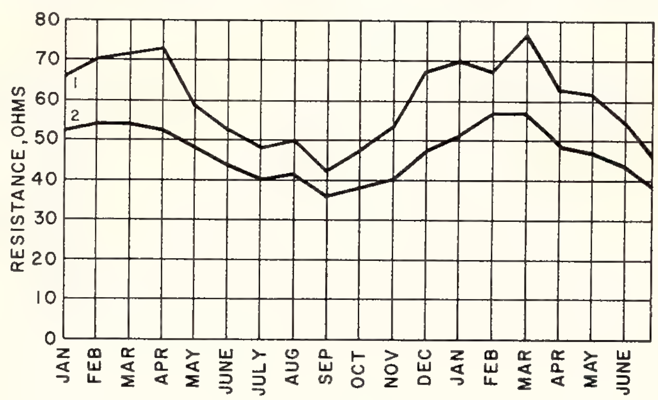


Fig. 2– Seasonal variation of earth resistance with an electrode of ¾-inch pipe in rather stony clay soil. Depth of electrode in earth is 3 feet for curve 1, and 10 feet for curve 2. (Source: reference 1.)

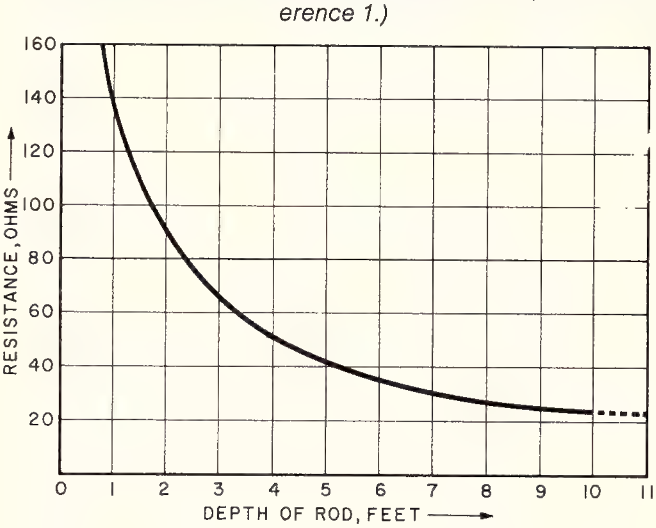


Fig. 3– Earth resistance decreases with depth of electrode in earth. (Source: reference 2.)

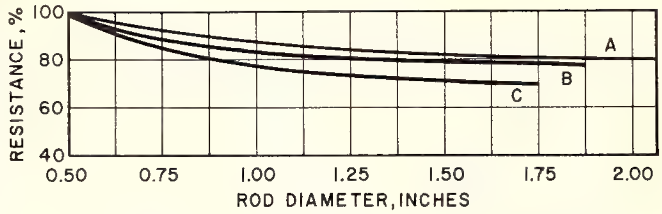


Fig. 4– Diameter of a rod has little effect on its earth resistance. (Sources: curve A, from reference 2; curve B, average of Underwriters Laboratories tests at Chicago; curve C, average of Underwriters Laboratories tests at Pittsburgh.)

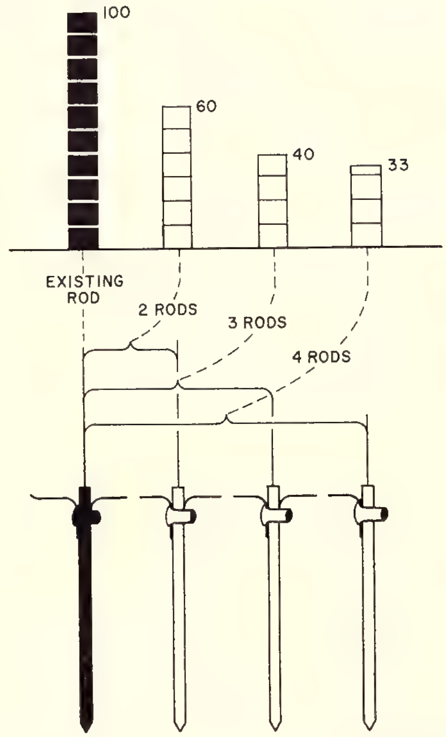


Fig. 5– Average results obtained from multiple-rod earth electrodes. (Source: reference 3.)

resistance only about 10%. Fig. 4 shows this relationship. For example, a 10-foot deep rod, 5/8 inch in diameter, has a resistance of 6.33 ohms; increasing its diameter to 1¼ inch lowers the resistance only to 5.6 ohms. For this reason, you normally consider increasing the rod diameter only if you have to drive it into hard terrain.

Use of Multiple Rods. Two well-spaced rods driven into the earth provide parallel paths. They are, in effect, two resistances in parallel. The rule for two resistances in parallel does not apply exactly. That is, the resultant resistance is not one-half the individual rod resistance (assuming they are of the same size and depth). Actually, the reduction for two equal-resistance rods is about 60%. If three rods are used, the reduction is 40%, and if four, 33%. (See fig. 5.)

When you use multiple rods, they must be spaced further apart than the length of their immersion. There are theoretical reasons for this, but you need only refer to curves such as fig. 6. For example, if you have two rods in parallel and 10-foot spacing, resistance is lowered about 60%. If the spacing is increased to 20 feet, reduction is about 50%.

Treatment of the Soil. Chemical treatment of soil is a good way to improve earth-rod (electrode) resistance when you can't drive deeper ground rods because of hard underlying rock, for example. It is beyond the scope of this article to recommend

the best chemical treatment for all situations. You also have to consider the possible corrosive effect on the electrode. Magnesium sulfate, copper sulfate, and ordinary rock salt are suitable non-corrosive chemicals. Magnesium sulfate is the least corrosive, but hard on the pocketbook. Rock salt is much cheaper and does the job if applied in a trench dug around the electrode. (See fig. 7.)

Chemical treatment is not a permanent way to improve your earth ground-rod (electrode) resistance. The chemicals are gradually washed away by rainfall and natural drainage through the soil. Depending upon the porosity of the soil and the amount of rainfall, the period of replacement varies. It may be several years before another treatment is required.

Chemical treatment also has the advantage of reducing seasonal variation in resistance that results from periodical wetting and drying out of the soil. (See the curves in fig. 8.) However, you should consider this method only when deep or multiple ground rods are not practical.

Incidentally, my ground system consists of three 8-foot 5/8-inch diameter ground rods driven 16 feet into the ground around the tower base. These are connected at the top and up from the ground with #4 solid copper wire to each of the tower legs. The copper wire also runs directly into my shack (I tie my gear to the wire) for grounding purposes. All connections to the #4 copper wire are silver soldered.

Now, folks, with all of this data, none of you should have a poor ground system. My thanks especially to the authors of *Getting Down to Earth* (reference 4) from which most of this information came.

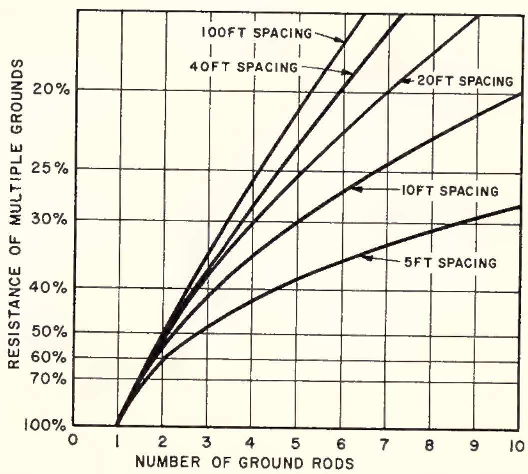


Fig. 6– Comparative resistance of multiple-rod earth electrodes. Single rod equals 100%. (Source: reference 3.)

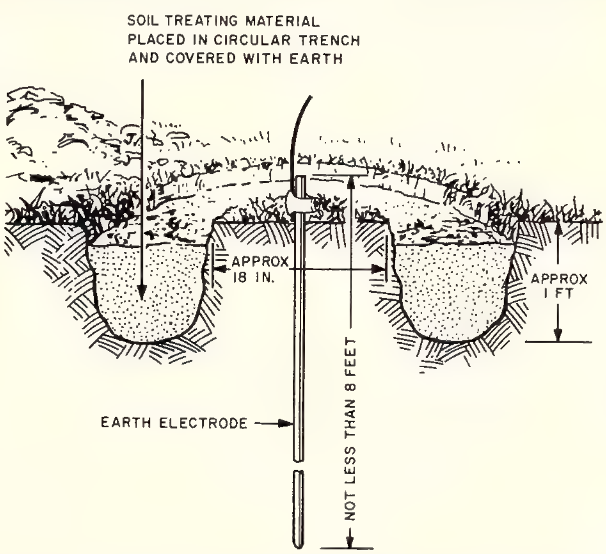


Fig. 7– Trench method of soil treatment. (Source: reference 3.)

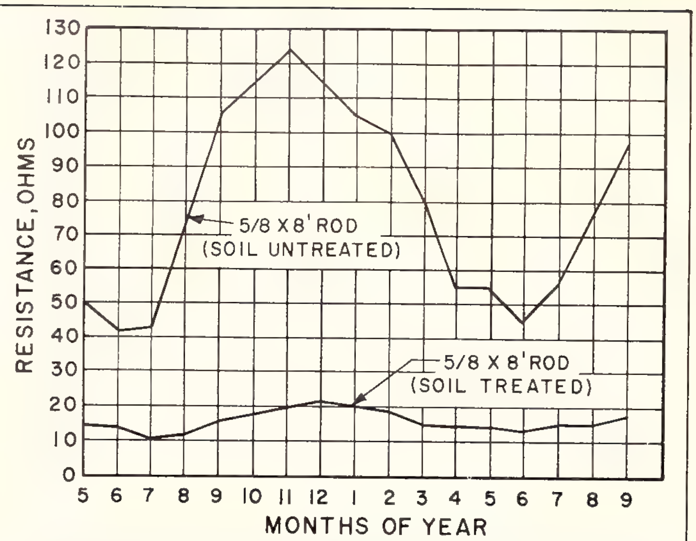


Fig. 8– Chemical treatment of soil lessens seasonal variation of electrode's earth resistance. (Source: reference 3.)

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4. *Getting Down to Earth,* third edition, James G. Biddle Co., Plymouth Meeting, PA, October 1970.

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MLT-2500 2KW Antenna Tuner: 1.8-30 MHz continuous; Tunes coax, wires and balanced line; Wattmeter accuracy ± 10% of full scale; 14″W x 5.5″H x 14″D; 28 lbs.

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MLX-2500 Transceiver: (NDT Tuner Optional) 160-80-40-30-20-17-15-12-10 Meter amateur bands; USB, LSB, CW; 500 watts PEP SSB, 400 watts CW; 0.5uV for 10 db S/N; 120/240VAC 50/60 Hz Supply built in; All Silicon Solid State Receiver; 2-6MJ6 tubes in transmitter output; 14¼″W x 5¼″H x 14″D; 29 lbs.

MLA-2500 VHF 2 Meter Amplifier: 50-54 MHz, 142-150 MHz; 1800 Watts PEP, 1000 watts F.M. or C.W., 875 watts A.M. Linear; 8122 Ceramic/Metal Tetrodes; 120/240 VAC, 50/60 Hz; 14″W x 5″H x 14″D; 49 lbs.

Clipperton-L Linear Amplifier: 160-15m w/some MARS; 2KW PEP SSB, 1KW DC CW, RTTY/SSTV; (4) 572B's, 65-150w drive; Size: 14½″W x 6″H x 14½″D; 42 lbs.

GLA-500 VHF Amplifier: 144-150 MHz; 500 Watts Input PEP SSB; SSB 50%; CW, FM-35%; 115-120 or 230-240 VAC 50/60 Hz.; 1-4CX250B Metal/Ceramic Tetrode; 11″W x 5½″H x 11″D; 31 lbs.

Clipperton T Antenna Tuner: 2 KW Tuner; 1.8-30 MHz Continuous; Tunes coax, wires or balanced line; 14¾″W x 6″H x 14½″D; 22 lbs.

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OPEN-WIRE FEED LINES
A TIME FOR REVIVAL?

BY LEW McCOY*, W1ICP

I have received several requests to do an article on open-wire feed lines. Coaxial lines can be expensive, but open-wire lines can be homemade, and usually inexpensively. We all know that if we can do a good job and save money in these hard times, it is certainly the way to go.

To many amateurs who have entered the hobby, say in the last ten years or so, open-wire feeders are for the most part something they have only heard about and usually something that only old timers use. To put things in order, let's talk about a little history and see why coax has become so popular, when actually in many ways open-wire feeders are better.

WW II—Who Wants To Remember?

Up until WW II, coaxial lines were not used to any degree in amateur radio simply because they were so expensive—and for that matter, rare. When the war came along, coaxial feeders became the more popular type of line to use in radio communications, and hence, many factories manufactured the lines. We also might add that the development of radio lent itself to the desirability of using coax.

Just a few years after the war ended, television reared its ugly head—ugly at least as far as amateur radio was concerned—and we had t.v.i. Up to this time, the popular final stage of an amateur rig consisted of band-changing by using plug-in coils (and open-wire line feeders). However, it quickly became apparent that amateurs couldn't use plug-in coils simply because the transmitter needed extremely tight metal shielding—lots and lots of screws and metal cabinetry. Many amateurs of that era, including yours truly, were searching for methods to be able to operate a bandswitching amateur station in the near field of a TV set without causing t.v.i.

The work of George Grammer, W1DF (former Technical Director of the ARRL, and my boss at the time), and Phil Rand, W1DBM, was truly monumental in helping amateur radio survive a crisis many believed would be the end of amateur radio. While it is old hat now, I traveled the entire 48 states and lectured and demonstrated cures for t.v.i., all sponsored by the ARRL. In any event, Rand showed the way with tight shielding, and Grammer, with his work on low- and high-pass filters, provided the methods for attenuating undesired transmitter harmonics that could cause t.v.i.

The result of all this work ended with really only one way to go: a completely shielded bandswitching rig the output of which could be fed through coax to a low-pass filter. The Collins pi-network designed by Art Collins lent itself to bandswitching while still being completely enclosed (no plug-in coils, etc.) and could work into a 70- to 50-ohm load, the two popular values of coaxial line impedances. The Grammer low-pass filters fit these impedance values effectively. Of course, the next logical progression was multiband antennas that didn't need to be switched, but could be fed with a single length of coax, or at the most, two lines. Another interesting historical note: Ed Buchanan, W3DZZ, is generally credited with the idea of using traps in wire and beam antennas (coax fed, of course), and this also changed the complexion of amateur radio as far as feeding was concerned.

As Novice Editor of *QST,* I fought the tide for years, preaching the advantages of open-wire lines. To make open-wire lines work with multiband antennas meant using antenna couplers (Transmatches, as they are now called), so I built and described scores of different types of Transmatches over the years. I am not trying to throw rose petals over my head, but most of the Transmatches used in today's stations are designs, or offshoots, of mine. The important point here, though, is that any of these present-day Transmatches can be made to work—and simply—with open-wire lines. I tend to ramble in my technical writing, so forgive me for not mentioning the countless amateurs who were also involved in this evolution in amateur radio.

Coax—Advantages and Disadvantages

Let's face it: coax is a very convenient line to use. You can snake it through walls, tie it to metal towers, and even bury it if it happens to be the right kind (much more expensive). Coax is flexible in that it can be run around tight corners; the outer jacket is insulated so that it can be mounted directly on metal. Also, coax helps prevent the pickup of undesired interference via the feed-line route.

On the other side of the coin, coax is basically a lossy line. The line is very frequency dependent in that the higher the frequency, the greater the loss. The best way to illustrate this is to use an example of 100 feet of RG58/U on 2 meters. Under a matched condition—an antenna with an impedance of 50 ohms, and the RG58/U impedance of 50 ohms—the s.w.r. would be 1 (or 1:1). Under these conditions, and using brand-new, good-grade coax, the loss in the 100 feet would be 5.9 dB. Converting that to watts, assume 100 watts coming out of the transmitter. The 5.9 dB loss would mean only about 25 watts would reach the antenna! The transmission line would consume 75 watts power! Now that's a lossy line!

**200 Idaho St., Silver City, NM 88061*

As I pointed out in an article on s.w.r. a few months back, one really cannot tolerate an s.w.r. of much more than 3:1 on any bands higher than 20 meters. On 80 and 40, one can get along with higher ratios, but bear in mind that as the s.w.r. increases, so do the losses on the coax. Coax requires fittings, and what many amateurs overlook, particularly at v.h.f., is that if the fittings are not properly installed, the losses can skyrocket. I saw a demonstration at the Dayton Hamvention of a product called "Coax-Seal" in which well-installed fittings were run under water. Without the sealant around the fittings, the losses at the fittings were phenominal. Getting back to matched and unmatched conditions, I don't think anyone will argue that coax must be matched as closely as possible to its characteristic impedance.

Open-Wire Line— Good and Bad Points

What's bad about open-wire line? Probably its inconvenience in installation and methods of coupling the transmitter. The impedance of open-wire line depends on the size of the conductors used, the spacing between the conductors, and the insulators used to separate the two conductors. First, let's state that none of these are very important. There are a few parameters that should be observed in the construction of open-wire feeders, but none of these are truly critical. These points will all be covered in a moment.

On the good side, and believe me the good side is really good, the major advantage is that for all practical purposes open-wire feed line is a lossless line. In other words, you can use long runs of it, have a ridiculously high standing-wave ratio, and still wind up with nearly all of your power leaving the rig and reaching the antenna to be radiated.

Look at the beauty of this example. Assume we put up an 80-meter half-length dipole fed with open-wire line from a Transmatch. Between the Transmatch and the rig we use a short length, or lengths, of 50-ohm coax and an s.w.r. bridge. Fig. 1 is an example of this setup. Further, let's assume that the impedance of the open-wire feeder is 400 ohms (although the line impedance is of no real importance). Also, add one more factor: the purpose of any feed line is to carry the power from the rig to the antenna and to do it without radiating. After all, if it radiates, it becomes an antenna. By definition, a feed line isn't supposed to radiate, because the field in one conductor cancels the field in the other conductor, also—and this is important—regardless of the standing-wave ratio. Some amateurs mistakenly believe that high s.w.r. causes a line to radiate. Not so. Let's finish our assumption by stating that the impedance of our antenna is the theoretical 70 ohms of any halfwave dipole.

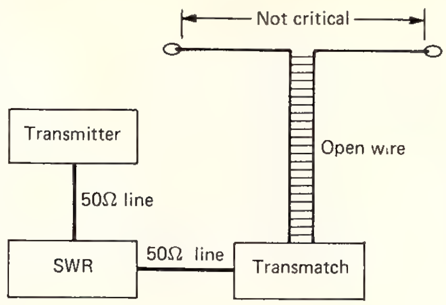

Fig. 1– This shows a typical setup using open-wire feeders. While antenna length is not specified, it should be at least one-quarter wavelength long at the lowest operating band for best efficiency—the longer the better.

The standing-wave ratio on 80 meters with our system will be 400/70, or almost 6:1. Keep in mind that open-wire line is practically lossless, so our only problem is to couple our transmitter to the antenna system, and we do this via the Transmatch. We lose a very small amount of power in the Transmatch, but really no measurable amount in the feed line, so the majority of power reaches the antenna and of course is radiated! So we bandswitch the rig to 40 meters, the antenna becomes a full wavelength, and the impedance goes to 4000 ohms. Our s.w.r. is 400 (feed line) divided into 4000 (the antenna), or 10:1.

We adjust the Transmatch so that our s.w.r. on the 50-ohm line connecting the rig to the Transmatch is 1:1. Our transmitter "sees" a 50-ohm load even though the s.w.r. is 10:1 on the open-wire line. Again, that line is lossless, so the power goes to the antenna and does the job for us. Going to 20, 15, or 10 meters with the system could present some real matching and loss problems if we tried to use coax with direct feed. However, with our lossless open-wire line and Transmatch, we can easily match on these bands with no appreciable losses (this also includes the new bands, when we get them).

It should also become apparent that if we have a relatively lossless line, and all the power has to go to the antenna, then the actual length or impedance of the antenna isn't too important. (Actually, a good rule of thumb is to make the antenna at least one-quarter wavelength long on its lowest operating frequency.) It also should become apparent that if we have a relatively lossless line, and all the power has to go to the antenna, then the actual length of the antenna isn't important.

You can make your antenna long enough to fit whatever supports you have, and *presto!*, you have a real multiband antenna. Another point to keep in

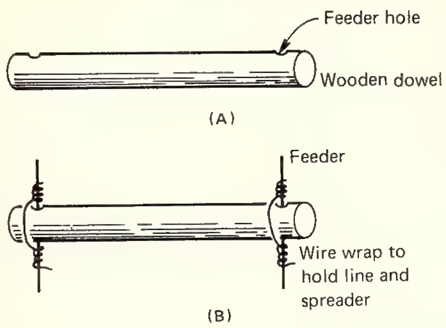

Fig. 2– Details of open-wire line construction using dowel rods. Further details are in the text.

mind is that if the antenna is longer than one-half wavelength, it is going to have gain in some directions. Our 80-meter dipole example would produce gain on 40, 20, 15, and 10.

So Where Do I Find Open-Wire Feeders?

Yeh, good question. A company called Saxton did make open-wire line, but I don't know if they are still in that business. TV-type open-wire line is probably still available (Radio Shack). However, we are trying to save money, so the way to go is to make your own line, and believe me it is simple. You can go for any line (wire) spacing over 2 inches. I prefer 4- to 5-inch spacing because it takes fewer spacers.

A very old-fashioned method of making spreaders is to use pieces of wooden dowel rod soaked in paraffin; the paraffin serves as a moisture inhibitor. I would suggest ¼- or ⅜-inch diameter dowel rod. Dowel rod comes in 3-foot lengths and can be cut into 4-inch lengths, providing 27 spacers. If these were mounted 3 feet apart, that would provide an 80-foot feed line. Cut the spacers from the dowel, and drill holes large enough to take whatever size wire you have handy or plan to use. The holes should be about ¼ inch in from the end of the spacer (not critical). The paraffin, available at any supermarket (sold for canning purposes), should be heated and melted in a double-boiler, and the spacers should be dunked long enough to soak up some of the paraffin.

The feed-line wire size isn't critical. It can be anything from No. 12 on up, providing it is strong enough. Electric fence wire is good, but it needs to be pulled taut for awhile to get the curl out of it. Fig. 2 shows the detail for installing the spreaders. The wires are fed through the holes, and then small pieces of wire are wound around the spreader end and the wire to hold it in place. I usually find something to which to tie the feeder wires, stretch them out, feed the spreaders on, and then lock the feeders in place.

Dowel rod is one way to go, but there are countless others. Plastic hair curlers, the smallest diameter PVC pipe cut up into sections, or pieces of PVC or polystyrene are just a few suggestions. Amateurs are supposed to be creative and ingenious. Here is your place to shine.

Using the Line

As mentioned earlier, a Transmatch is required in nearly all instances for using open-wire feeders (and, of course, everyone has a Transmatch these days!). However, aside from the Johnson Matchbox, nearly all Transmatches, unless they have an output balancing circuit installed, are made for single wire, or coax feed. While it cannot be called good, sound technical advice, it is possible to use these types of Transmatches with open-wire line. The "unsound" method is to connect one conductor to the single-ended output of the Transmatch and connect the other conductor to the metal case (ground) of the Transmatch. A good earth ground should be connected to the Transmatch. This method does not achieve a perfect balance for the feeders, but it is a cheap and dirty way to make them work.

The other method consists of installing a balun on the output of the Transmatch and connecting the feeders to the balun (see fig. 3). Using the balun is supposed to balance the feeders. However, in all honesty, in my entire amateur career I have never seen any feeders, coax or open-wire, that were completely free of radiation—at least when they attached to an antenna and not a dummy load.

However, don't despair if you have some feed-line radiation. In 90 percent of the cases it only means that you have some signal going out from your feeders and helping you work someone! (The power isn't lost or necessarily wasted.) The bad 10 percent would be in the case of a directional antenna such as a beam. Here you must try to avoid feeder radiation because it will upset (usually) the radiation pattern.

If you want to make your own balun, the various handbooks have details, but you should use type T-200 core and Teflon-covered wire. (Palomar Engineers stocks the items, and you'll find their ad elsewhere in this issue.)

Installing the Line

Some amateurs will say fine, I would like to use open-wire line, but it is a real hassle getting through the walls to my station. In my case, I run open-wire line to the house near the shack, anchor it there, and then come into the shack to the Transmatch with a heavy-duty 300-ohm twin-lead (Radio Shack). Don't worry about the impedance change from 300 ohms to whatever your open-wire line happens to be. Just keep in mind that both types of lines are very low-loss, and no unbalance takes place by hooking the two together. This, of course, raises the question of using 300-ohm twin-lead for the feeders instead of open-wire line. Usually, the only limit would be the power-handling capabilities, particularly with a very high s.w.r.—say 20, 30, or 40 to 1. Almost any open-wire line could handle the amateur legal limits, and with extremely high s.w.r. I have experienced ordinary 300-ohm twin-lead, running 1 kw, actually heat up and melt, but I know the s.w.r. was over 40:1. Twin-lead is higher loss, but still much better than coax.

Fig. 1 shows a typical setup with open-wire line (or twin-lead). Keep in mind that your Transmatch is merely an adjustable r.f. transformer (and reactance tuner-outer). The Transmatch takes the unknown load on the antenna feeder side and converts it to a 50-ohm load. Using as low a power as possible that will provide you with an indication on the s.w.r. indicator, adjust the Transmatch and rig for a match of 1:1 on the coax line between the two. Once matched, you can increase power. On some bands matching will probably be critical and not very broad, while on others you may be able to QSY from here to there without ever touching the Transmatch or rig. One thing I know for sure: once you learn to use open-wire feeders, you'll become converted. Now, by gosh, I can put up my antenna on that 500-foot hill and not worry about the feed-line losses!

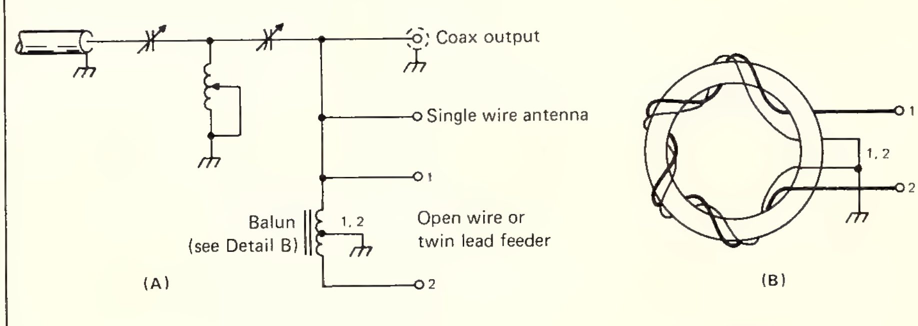

Fig. 3– Here is the circuit of a typical Transmatch at (A). The output shows the modification for adding a balun for balanced feeders. At (B) is the circuit of a balun that could be used. It consists of 12 or 13 turns of bifilar windings using Teflon-covered wire, No. 14. The turns are wound on T-200-2 core available from Palomar Engineers.


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VK2DPN has achieved some remarkable, if not enviable, feats of DX while operating mobile. Part of his success is due to his mobile antenna farm, which we'll let him describe.

THE SAGA OF THE MOBILE PORCUPINE

BY PHILIP GREENTREE*, VK2DPN/ZL3TKF

Soon after receiving my VK Novice license in February 1980, I realized that operating mobile was not a disadvantage, but was an exciting challenge.

In my profession I drive an average of 38,000 miles per year in the lower north coast region of N.S.W., and amateur radio has become a valued companion during the long hours driving and many nights away from my Newcastle home. The challenge of attempting DXCC Mobile under VK Novice restrictions of 30 watts p.e.p. and narrow allocations on 10, 15, and 80 meters was accepted. As the cards arrived, I realized that I was within reach of Single Band DXCC Mobile and WAZ Mobile on both 10 and 15 meters.

DXCC Mobile was completed in seven months under my old VK Novice call VK2VUQ and was the first DXCC Mobile ever issued by the Wireless Institute of Australia. Also received was DXCC Mobile from *QST* magazine. Since then I have confirmed Single Band DXCC on 10, 15, and 20 meters under my full grade call of VK2DPN.

In the chase for WAZ I had to wait 18 months to find Zone 34. Then I worked five amateurs in that area in a fortnight, proving the fickle nature of propagation. One can imagine my feelings on receiving a letter from Leo Haijsman, W4KA, *CQ*'s WAZ Manager, informing me that my WAZ was the first ever achieved mobile!

At the time of this writing 38 zones are confirmed on 10, 38 confirmed on 15, 34 confirmed on 20, and 16 on 40 meters. Multiband shows I only require 17 zones to reach the *CQ* 150 zone plateau—a world first for a mobile. WAC Mobile has been achieved on 4 bands along with WAS Mobile on 10 meters. I had to return an incorrect card and on receipt will apply to the ARRL for the first WAS Mobile on 10 meters from VK.

*7 Heather Crescent, Garden Suburb, N.S.W. 2288 Australia

Philip Greentree, VK2DPN, standing in front of his "mobile hamshack."

Cards from 105 countries have been submitted to the Philippines ARS claiming the coveted DU United Nations award, and believe I am one of the few VK's and the only Mobile to qualify for this award. My DXCC count stands at 224 countries with 205 confirmed.

The question, no doubt, is how has this been achieved? Operating technique has been a significant factor, and I quickly adopted the philosophy "If you can hear them, you can work them." However, it is a waste of time just yelling wildly in a pile-up, as the base-station linears and arrays will drown out a mobile. It is important to listen for awhile to the DX station's style of operating and to where he has propagation. There is always a moment when you can break through the stateside kilowatt barrier and into the back of the DX station's beam.

In confirmation of this I have the Worked All Pacific Award from N.Z., and Worked All Pacific Countries (45 countries) from the I.S.W.L. I can honestly say that every country was worked independently of net operation, although I greatly enjoy the camaraderie of internationally famous DX nets such as A.N.Z.A. on 15 meters, and the Pacific DX and the Caribbean-Oceanic DX nets on 20 meters.

If attention is not paid to the antenna system, forget the whole idea, as antennas are the key items. The photographs will demonstrate my antenna layout. On 10 meters a helical whip consisting of Teflon-coated aluminum wire wound around a 4.92 foot long fiberglass rod is used. I added a small circular capacity hat which broadbanded the helical, giving a maximum v.s.w.r. of 17:1 from 28.2 MHz to 29.1 MHz. On my previous vehicle this was mounted on the roof racks, but I now leave it in the trunk for 10 meter open-

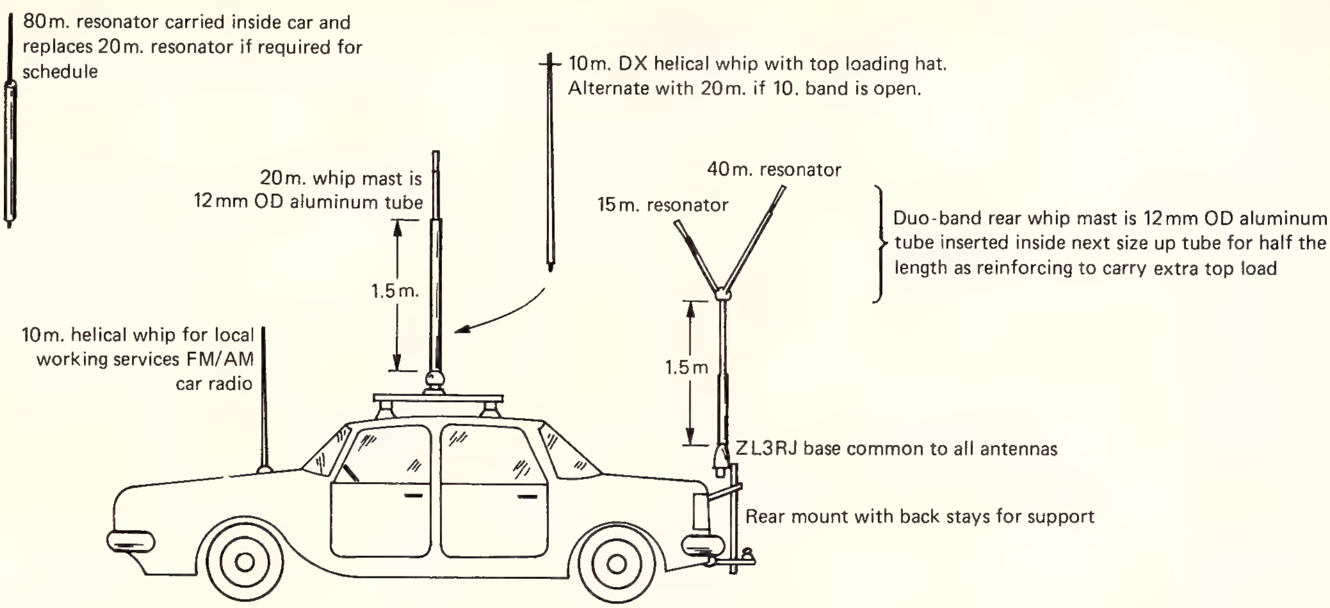


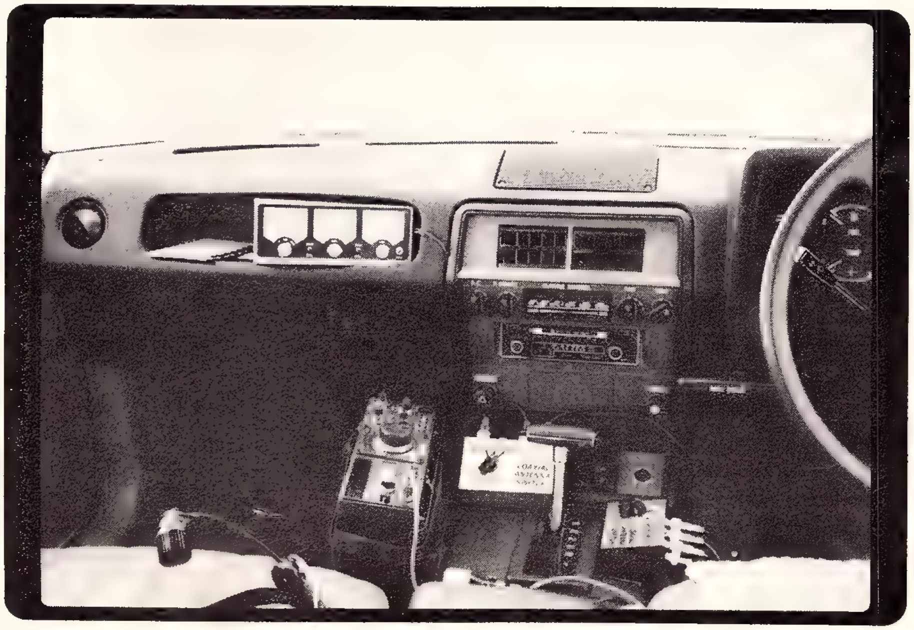
Fig. 1– The basic antenna system of VK2DPN. It seems guaranteed to capture attention on the bands and on the road.

ings. I use another smaller helical for 10 meters mounted on the front left fender for local and short-haul contacts. I can also switch this antenna into the car's a.m./f.m. stereo radio system, and believe me, f.m. stereo booms in on 103 MHz.

Australian-made Scalar resonators are used on all other bands, although my Kenwood TS-130S at full power did produce some interesting corona effects, particularly on the lower frequencies. I will never forget the reaction of a highway patrol officer one night as we were both waiting at traffic lights. He was frantically pointing towards my 40 meter whip yelling, "Your car's on fire. Get out quickly." On checking, I discovered that a 1 foot long corona sparking in time with s.s.b. looked very dramatic. I soon replaced the tuning rods with inverted conical top-loading hats, which solved the corona problems, broadbanded the resonators, and increased the resonators' efficiency as demonstrated on a power meter.

The whips are made from aluminum tubing cut to just about 5 feet, and the multiband base for the 40 and 15 meter resonators (run in 45° offset) was machined for me by another Newcastle amateur, Don, VK2DXH, famous for his 12-element triband monster beam. The antenna bases are designed and manufactured in New Zealand by ZL3RJ, and I believe them to be unsurpassed.

As the photographs indicate, there are three h.f. mounts on the vehicle. The use of a luggage rack instead of a single roof bar is deliberate, as it forms part of the ground plane. The rear mount was designed so that the antenna would be mounted above the trunk lid, giving a much better angle of radiation and avoiding the capacitive effect from the metal body of the car, as experienced with the traditional bumper mount. Rigid braces affix the vertical support pipe to each side of the car and are attached under the trunk lid.



Inside the fully air-conditioned ham shack at VK2DPN. Note the semi-homebrew head mike on the passenger seat and 500-ohm tape recorder mike mounted in the lower center of photo. Just visible is the mike switching box containing an impedance step-up transformer matching both mikes to 50K ohms to give high output for use with the TS-130S. The three-position coax switch to the front left of the gear shift switches the 10 meter helical from the TS-130S to the a.m./f.m. stereo car radio mounted in the dashboard. The coax switch mounted to the right of the gear shift switches the TS-130S between the three h.f. whips. Power/modulation/v.s.w.r. meter (in line) is seen at the top left. All equipment except the TS-130S is affixed with 3M double-sided tape. TS-130S bracket is held by four self-tapping screws. The TS-130S uses the speaker-mounted center dashboard above the central air-conditioning vents.

Very close attention must be paid to the ground, more so than with a base station. The car's metal body is the antenna ground plane, and if there is any doubt about electrical contact between the roof racks and the car body, determined efforts must be made to achieve good electrical contact to the roof gutter. Small drill holes under the gutter ledge and self-tapping screws holding ground straps from the roof racks involve little work and damage to the car and are easily rectified at trade-in time.

There is no doubt that the larger the

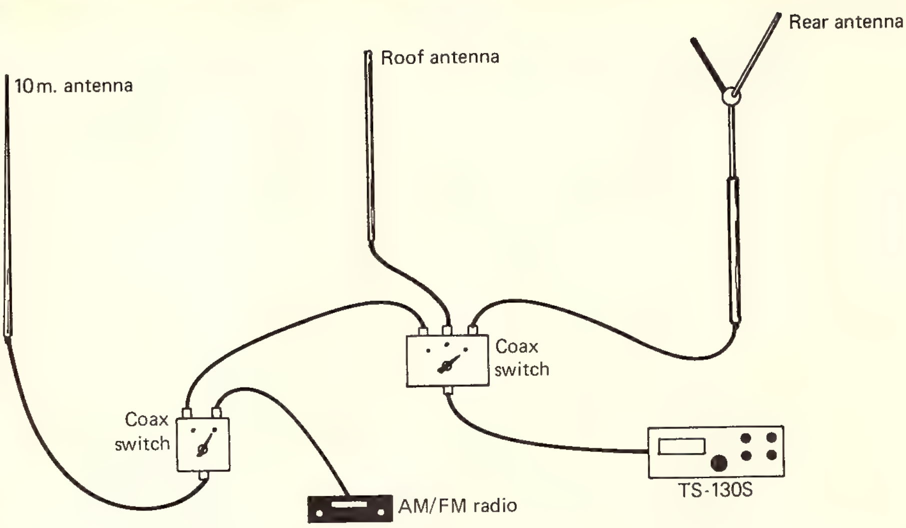


Fig. 2– The antenna switching system.

Photo of the mobile antenna bases used. They were designed and built in New Zealand by ZL3RJ. Note the simplicity of mounting and feeding coax to the base. The aluminum whip section terminates into a brass base machined and threaded to fit the antenna base.

car, the better the ground plane, as I am proving to myself having just changed to a new Ford Falcon roughly 50% larger than my previous medium-size car.

Antennas for the various bands alter their characteristics according to their location on the mobile. Overall, 10, 15, and 20 meter antennas are vastly superior when mounted on the roof racks where they perform as omni-directional ¼-wave ground planes. However, 4-band mobile operation calls for compromises, hence the configuration chosen.

Fifteen meters is very directional when rear mounted, but this proved to be advantageous, because when you are on a DX band, you need only point the car in the right direction for maximum effect. What I haven't established is whether there is actually any gain derived from the directivity of the radiation pattern following the ground plane effect of the car's metal body. What I *have* established is up to 5 to 6 S points drop in my signal at the other end when I transmit rear end on rather than through the ground plane of the car. Don't laugh—a compass can be very handy. The 80 meter resonator doesn't care where it lives, but I find 40 meters is best when the antenna is rear mounted.

My transceiver is a Kenwood TS-130S, which is a magnificent mobile unit giving outstanding reliable service. Although the noise blanker is excellent, I find a degree of extraneous noise still gets through, so I use a 2-inch diameter toroid near the transceiver with the RG58 coax fed through the toroid and wound around four times on one side then crossed to the other and wound four times in the opposite direction. Try it—it works in most cases.

I have read numerous articles on many and varied mobile systems in recent years, including articles from Z.E., WI, and W4. But as a fanatical, totally addicted DXer, I prefer individually tuned whips for each band. My system may raise a lot of strange looks from onlookers (paranoia is not a healthy condition, I assure you). In their own particular situations the other systems may work well, but I feel my system's record speaks for itself.

Happy mobiling and good DXing! CQ

a monthly feature by
KARL T. THURBER, JR., W8FX

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

The Transmatch Revisited, Part II

Last month, columnist W8FX kicked off this discussion by first defining the transmatch, and then going on to discuss transmitter matching considerations and basic circuit designs. This month he continues with more timely information about these interesting devices.

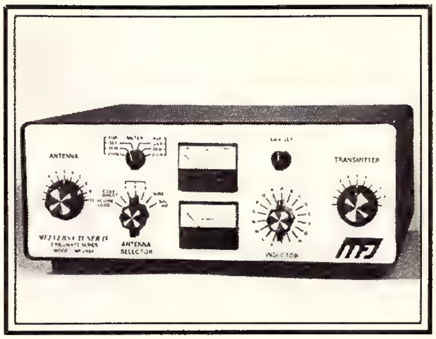
In last month's column, we offered a definition of the transmatch and highlighted some important transmitter, feedline, and antenna matching considerations. We pointed out some uses and limitations of the transmatch, and also delved into fundamental matching circuits.

This month, we continue with a discussion of some sophisticated transmatch designs, particularly the so-called "ultimate" or "universal" transmatch. We will also make mention of the transmatch and harmonics, and we will go into some receiving and installation considerations.

Getting Fancy

In last month's column, we described several basic types of transmatches, including the "L," "T," pi-network, and bandpass designs. Actually, there are about as many different transmatch variations around as there are antennas. One of the most popular derivatives of the "T" is the so-called "ultimate" or "universal" transmatch the design of which was pioneered by former ARRL staffer Lew McCoy, W1ICP, in a series of *QST* articles several years back. These transmatches are so named because they are designed to enable the operator to couple his transmitter to practically any antenna system, regardless of impedance. The term "transmatch," in fact, has become virtually generic for *any* antenna tuner.

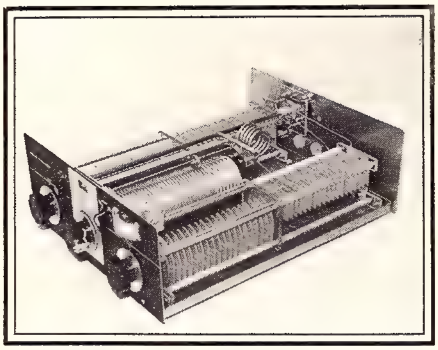
Some background on the ultimate transmatch is in order. Early antenna tuners were relatively simple devices that were designed primarily to couple *open-wire* line to the transmitter, rather than coax. What was needed was a tuner that would be compatible with single-ended r.f. outputs and would work well coax to coax, but would handle open-wire and single-wire fed antennas as well. Some of the most effective (and, ultimately popular) tuners were introduced by Lew in the late 1950s and early 1960s when he was the *QST* Beginner and Novice Editor.



Model MFJ-984 Versa Tuner IV is representative of the "new breed" of match-anything all-in-one antenna tuners that combine several useful hamshack accessories in a single package. Deluxe 3 kw tuner matches practically any kind of antenna from 1.8 to 30 MHz. Antenna switch permits selection of two coax lines through the tuner and one line through or direct, or a random-wire, balanced-line or dummy load. Built-in balun, s.w.r. bridge, and r.f. ammeter complement the unit's features. A 200-watt 50-ohm dummy load allows the transmitter to be tuned off the air. (Photo courtesy MFJ Enterprises)

Lew was given the job by George Grammer, W1DF, then ARRL Technical Director and Technical Editor of *QST*, of running Novice articles on harmonics at least once a year—largely at the encouragement of the FCC. This effort was undertaken because there were so many problems with harmonics from Class "C" transmitters in those days. Consequently, Lew tried to do at least one "antenna coupler" article each year in the late 1950s and early 1960s. Around 1960, Lew came up with an idea for a coupler that he called the "50-Ohmer Transmatch" and which saw publication in the July 1961 *QST*. This was a sort of "line flattener," and it was probably the first circuit to work from coax to coax. It would handle a mismatch of 4 or 5 to 1, working either from high or low impedances or vice-versa. In order to attain some degree of harmonic suppression in the coupler, he used a differential split-stator capacitor in the input side to provide a capacitive "short to ground" for transmitter harmonics for about 10–15 dB suppression. This 1961 circuit is considered to be the forerunner of the ultimate transmatch.

Finding at the time that wider matching ranges were possible if more fixed taps on the coil were used (for a given band), Lew later discussed the transmatch with Al Placa, K2DDK, a New York ham. Al raised the intriguing possibility of increasing the matching range by changing the tapped inductor to a variable or *roller* inductor. He then made up a circuit using the roller, and found that he couldn't find a load he couldn't match to his transmitter. Lew breadboarded the circuit and confirmed that there was no load between 160 and 10 meters that *he* couldn't match. Lew went ahead with testing, ran the article in the July 1970 *QST* (giving Al credit), and calling the unit the "ultimate transmatch" because of the remarkable characteristics mentioned. The same circuit (which included a toroidal balun for



An example of the Murch series of "ultimate transmatches" based on the McCoy designs is this rugged UT-2000B. Interesting features include an internal switching arrangement that allows in-out tuner switching and selection of dummy load (not supplied), a rotary inductor which turns counter, r.f. relative power output meter, and heavy-duty capacitors and coils. The 2 kw unit can be used with almost any antenna, although an external s.w.r. meter should be used with the built-in r.f. meter for precise tune-up. (Photo courtesy Murch Electronics, Inc.)

*317 Poplar Drive, Millbrook, AL 36054

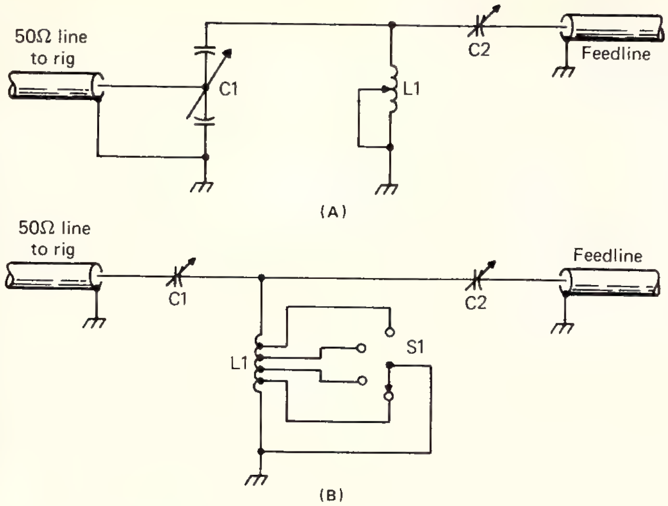


Fig. 1– At (A) is the circuit diagram of the ultimate or universal transmatch. C1 is a split-stator capacitor with a value of 150 pf per section or more. L1 is a rotary inductor with minimum total inductance of 18 uh, and C2 should have a minimum value of 200 pf. These figures will provide coverage from 3500 kHz through 30 MHz. At (B) is the popular transmatch configuration used by many manufacturers. Minimum values (C1 = 150 pf) are similar to the ultimate. If high power is used with this circuit, S1 must be designed to withstand extremely high r.f. voltages. The primary difference between the two circuits is that the ultimate has a wider matching range, and a match of 1:1 is possible with any load. However, only a slight "tailoring" of the antenna system would be required in order for that circuit at (B) to have the same match. (From CQ, January 1982, article by Lew McCoy, W1ICP, "S.W.R.—How Much is Too Much? Part I.")

balanced feeders) was later used in the ARRL *Handbook,* but was retitled the "universal transmatch," thereby adding some nomenclature confusion that persists to this day. This simple circuit, or slight revisions thereof (using single- vs. split-section capacitors; ferrite vs. air-core [or no] baluns; tapped vs. roller inductors; internal vs. external s.w.r. bridges; etc.), is employed in many of the antenna tuners manufactured and sold today.[1]

A closely related circuit is the SPC (series-parallel-capacitance) transmatch, a "T"-configured design which was developed by Doug DeMaw, W1FB, *QST* Senior Technical Editor. The SPC version, which upon inspection can be viewed as the "ultimate" hooked in reverse, provides a very wide matching range and a harmonic suppression capability comparable to that of the ultimate transmatch. The circuit was, in fact, developed in an attempt to maintain a *bandpass* response under load conditions of under 25 ohms to over 1000 ohms when fed by a 50-ohm transmitter. Details on the SPC transmatch are found in the ARRL *Handbook;* in the 1981 edition, it's covered on pages 19–10 through 19–13.

Fig. 1 shows a contemporary version of the ultimate transmatch, as well as a popular spinoff used by many tuner manufacturers. Fig. 2 shows the SPC transmatch.

Transmatches and Harmonics

In the "Novice heydays" (mid-1950s to late 1960s), a really big problem for beginners was caused by unwanted harmonics of their signals being radiated. For example, many an unsuspecting Novice's 7175 kHz fundamental signal was radiated nicely on 14350, 21525, and 28700 kHz, to be QSL'ed by an FCC monitoring station or ARRL "OO" (Official Observer). Higher-order harmonics, of

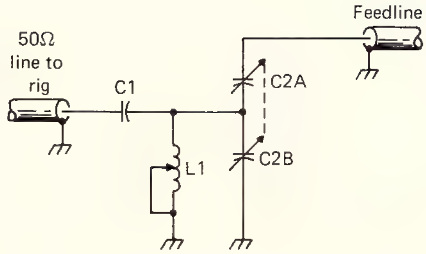


Fig. 2– A simplified version of the SPC transmatch, adapted from the 1981 edition of the ARRL Radio Amateur's Handbook. *Several "bells and whistles," such as a switching arrangement for a dummy load and tuner bypassing, and provision for balanced output using an air-wound balun, have been eliminated for simplicity. (See the* Handbook, *pages 19-10 through 19-13, for construction details.)*

course, falling in v.h.f. ranges, wreaked havoc with TV, f.m., and other services (and sometimes still do). Many of these problems, caused in large measure by the use of Class "C" final amplifier stages and mistuned tank circuits, were eventually overcome.

Today, harmonic radiation isn't the problem it once was; the FCC requires that all harmonics be down a minimum of 40 dB from the final stage. Most rigs these days are operated in Class AB1, AB2, or B, and they far exceed FCC specs for harmonic radiation. So, a transmatch should properly be considered as having a purpose primarily to provide a proper match between a 50-ohm rig and the antenna system, not to add harmonic suppression.

Nevertheless, use of the transmatch as a matching device carries with it the added plus of offering at least a few dB of *added* harmonic suppression thrown in. There's no harm in using one; you can usually stay completely out of trouble with respect to harmonics by taking several simple precautions in concert:

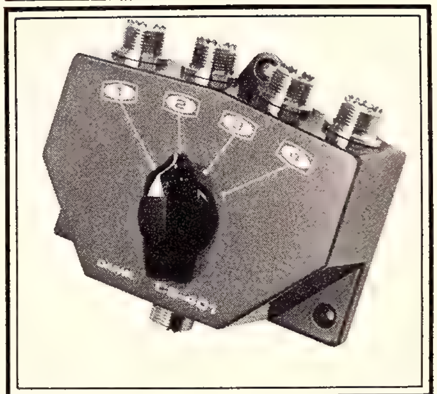
1. Don't use one of the older Class "C" Novice transmitters that "doubles" in the final amplifier stage on the higher bands, such as on 10 and 15 meters.
2. Make sure your transmitter/transceiver is well shielded and grounded.
3. Use a lowpass t.v.i. filter in conjunction with your h.f. rig's output.
4. Use a bandpass t.v.i. filter in conjunction with your v.h.f. rig.
5. Route the transmitter's output through an antenna coupler or transmatch for added "r.f. selectivity." Note that it's especially important to do this when using multiband antennas of all kinds, since such antennas will usually radiate harmonics almost as well as the fundamental frequency applied to them.

Assuming a transmatch is used, which type offers the best harmonic suppression? It's a toss-up, and also depends on whose engineering figures you take your bet on. In general, however, the link-coupled bandpass type, which is suitable for use between both coax and balanced-type feeders, gives a narrow-type response. The popular pi-network is also an excellent matching network for good harmonic attenuation, in that it has a lowpass characteristic: signals above a certain frequency taper off, being attenuated accordingly.

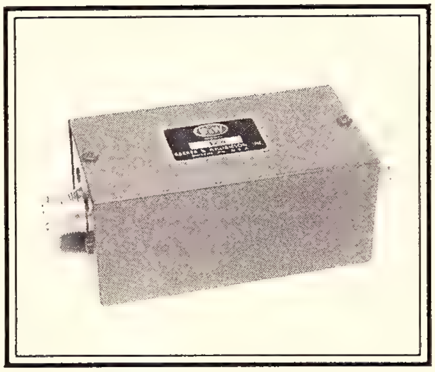
The situation is less clear with respect to transmatches based on the "ultimate" design. These may have either high-pass or bandpass response curves, which can result in from roughly 3 dB to 20 dB harmonic suppression under different tuning and loading conditions, such as the impedance-transformation being dealt with and the final inductance-capacitance ratio under matched conditions.

Since in real-life the exact conditions under which the matching network operates are seldom known, the level of harmonic attenuation is similarly unknown. Thus, as we have indicated, it's best to regard the transmatch strictly as a matching device. Any harmonic suppression that results—whether it be 3 dB, 12 dB, or 20 dB—should be regarded simply as a bonus.

[1]*Personal correspondence from Lew McCoy, W1ICP, dated Jan. 8, 1982.*



A professionally engineered, cavity-construction coaxial switch is a real convenience for antenna switching and/or selection of a dummy load for tune-up. If your tuner does not include such a feature, you may wish to purchase an external coaxial switch such as the Diawa 4-position unit shown here. Device features automatic grounding of all antennas except the one in use, an important lightning protection measure. (Photo courtesy MCM Communications)



A high-quality lowpass filter is recommended for use with all h.f. transmitters and transceivers as a way of avoiding, or at least minimizing, t.v.i. Normally, the best place to install the filter is directly to the rig's r.f. output terminal, between the rig and the antenna tuner/transmatch. B&W 50-ohm filter, shown here, has a cutoff at 44 MHz and has a minimum attenuation above that frequency of 60 dB. Insertion loss is less than 0.3 dB, with a power-handling capability of 100 watts. (Photo courtesy B&W)

What about t.v.i.? The transmatch won't offer a great deal of protection. However, several manufacturers sell effective lowpass filters that will attenuate harmonics in the v.h.f. range by 60–80 dB or more. These filters will not reduce harmonics falling *below* their cutoff frequency, usually somewhere between 35 and 45 MHz, but if installed properly, they will lockout t.v.i.-producing harmonics from your antenna.

If you suspect a problem with h.f. harmonics, consider having a nearby amateur listen in at the harmonic frequencies; pick an operator who lives at least a mile or two from your shack to make this check. If he can detect your signal, you *may* need the extra suppression a transmatch will provide. Another, but more expensive, way to go about harmonic reduction is to install special lowpass filters designed to pass certain amateur bands but sharply attenuate signals at all higher frequencies. You may want to use a bandpass filter for 50 MHz (6-meter) and 144 MHz (2-meter) operation to prevent both spurious radiation and harmonics from interfering with local TV reception. (Barker and Williamson makes a complete line of regular and special-purpose filters for amateur applications; Radio Shack, Drake, Unadilla/Reyco, and others sell a variety of lowpass models.)

A hedged approach is to use both the filter and the transmatch. The filter should be installed in the line between the transmitter and the transmatch, *not* on the "antenna side" of the coupler. Doing this will help ensure that the filter works into the right impedance, and that its operation will not be upset by a high s.w.r. on the line.

Receiver Benefits

Receivers as well as transmitters can benefit from the use of a transmatch. Most sets, and the receiver portions of transceivers, are designed to handle antenna input impedances ranging from 50 to 600 ohms. Coaxing the last microvolt of signal from the transmission line can't always be accomplished effectively without the use of a transmatch; the antenna trimmer or preselector controls on the receiver will tune the input stages, but rarely are flexible enough to ensure a proper match—particularly on the higher bands. For casual s.w.l.'ing, the transmatch can be a real boon, since in most cases the typical s.w.l. antenna is badly mistuned and may, in fact, represent little more than "so much wire" strung in the air.

Besides improved matching and enhanced signal-to-noise ratio, you will find that the transmatch has some side benefits worth noting. It can significantly increase your set's "front end" selectivity, or rejection of unwanted, out-of-band signals, just as in the transmitter. The added selectivity provided by the tuned circuit in the transmatch also will reduce problems such as image reception and cross-modulation.

Since good r.f. selectivity is often a problem with less-expensive communications receivers, the transmatch can provide a viable alternative to marginal reception without the additional expense of a new receiver purchased merely to improve front-end selectivity. MFJ and Grove Enterprises, for example, sell shortwave/longwave tuners that can be especially useful on the mediumwave and longwave bands, where reception often suffers badly from various cross-modulation and mixing effects from broadcast and other local, high-power transmitters.

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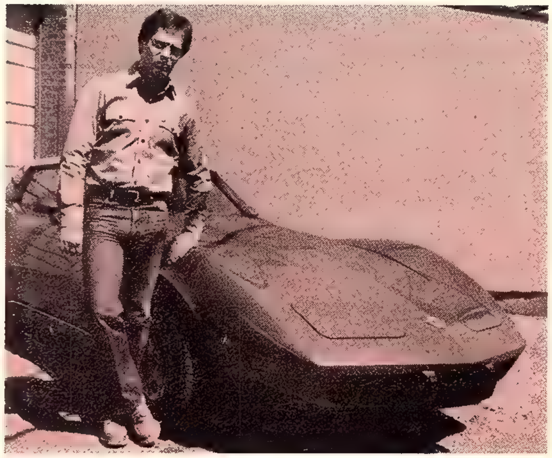

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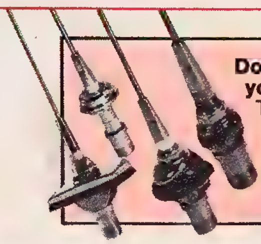

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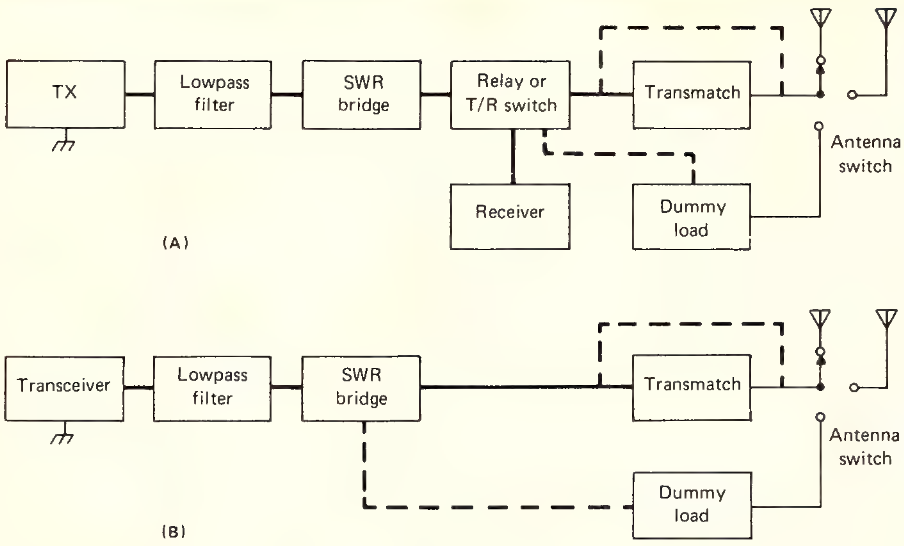

Fig. 3– A block diagram showing how various parts of your station are interconnected when using a transmatch. The diagram at (A) shows suggested wiring for use with a separate transmitter and receiver; either a relay or electronic transmit/receive switch can be used to effect r.f. switching from the transmitter to the receiver, if your transmitter does not already have a built-in means of antenna switching. The diagram at (B) shows equivalent connections for use when a transceiver is used in your hamshack. Most transceivers have internal switching arrangements. Transmatches will work equally well with transceivers or "separates." NOTE: A double-pole double-throw (d.p.d.t.) switch can be used to bypass the transmatch for direct antenna feeding. The dummy load can also be "switched in" on the transmitter side of the transmatch (see dotted lines). A heavy bonding strap should connect all equipment, and the entire installation should be well grounded. (From CQ, February 1980, article by Karl T. Thurber, Jr., W8FX, "Matching Your Way to DX: A Look at the Transmatch.")

If you prefer to use a separate antenna for receiving, you can build a small, receiving-type transmatch; it doesn't have to handle significant power. Far easier is to use your main station transmatch for *both* receiving and transmitting, using a coaxial switching relay or r.f.-actuated T-R (transmit-receive) switch to shift between transmitter and receiver. My preference—even when using a separate transmitter and receiver—is to use a common antenna for both, since antenna characteristics should be the same whether transmitting or receiving, and I won't waste calls to stations my transmitting antenna isn't "right" for. Of course, switching is accomplished automatically in the transceiver, although some sets do have a provision for a separate receiving antenna input. A wide-range transmatch would undoubtedly be useful with transceivers such as the ICOM 720A and Yaesu FT-One, which cover a broad chunk of the r.f. spectrum on receive, where the main station antenna is to be used far from resonance on these bands.

Transmatch Installation

It makes sense to mate the transmatch with an r.f. ammeter for an indication of proper transmitter tuning and loading. But while r.f. ammeters can be useful, particularly for low-power gear feeding single-wire antennas, the s.w.r. bridge is a more useful test instrument to mate

with the transmatch for precision adjustment. The s.w.r. bridge can give continuous indication of best match between the transmatch and the transmitter, and its monitoring capability is especially useful in indicating trouble in the transmission line or at the antenna.

Naturally, including the s.w.r. bridge as an integral part of the transmatch is very convenient and may be cost-saving as well. The transmatch also makes an excellent place to install a lowpass filter and antenna switch, too. Some of the newer commercial transmatches, in fact, include a built-in dummy load that can be switched in and out of the circuit for rapid transmitter tune-up and adjustment.

In fig. 3, we show a recommended r.f. block diagram for using a transmatch. At (A) is suggested wiring for use with a separate transmitter and receiver, while at (B) are shown equivalent connections for when a transceiver is used. Note that a lowpass filter is inserted in the line directly at the transmitter output. A ground is connected to the transmitter frame, the lowpass filter case, and the transmatch chassis. Coaxial cable (nominally 50 ohms impedance) is used between the transmitter or transceiver and the transmatch. The s.w.r. indicator or bridge is connected before the transmatch, as shown. A coaxial antenna switch may be used on the antenna side of the transmatch to effect antenna selection (illustration assumes coaxial antenna feed).

In connecting the transmatch, take special care to be sure that there is a good ground connection to the transmatch and transceiver or transmitter. One should not completely rely on the outer braid of the coaxial cable for a ground between the various units. A high-quality earth ground is important, and especially so if single-wire feed or parallel conductor transmission line is used to feed the antenna.

Wrap-up

To this point, we have discussed the transmatch as an important amateur station accessory. We have defined and discussed essential transmitter matching considerations, covered basic and advanced transmatches, highlighted the harmonic problem and possible solutions, and presented some transmatch receiving and installation tips. Next time, we will begin with a discussion of transmatch selection and adjustment considerations. See you then.

73, Karl, W8FX

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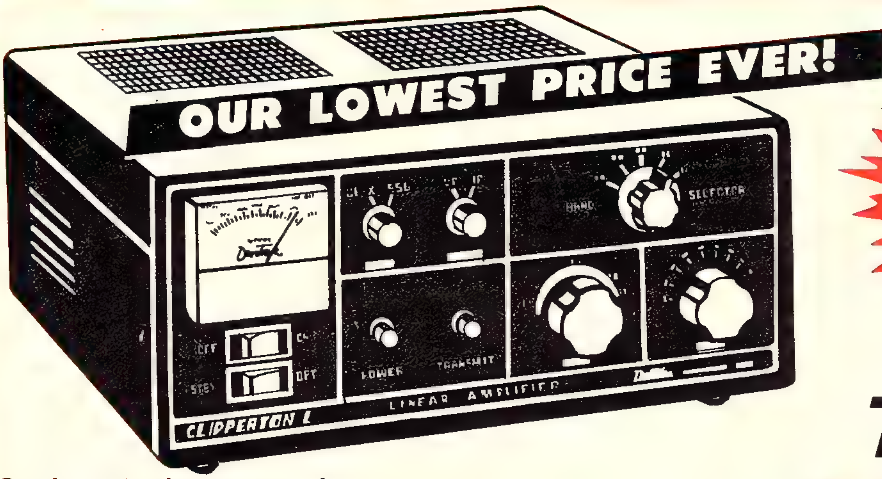

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For China, Amateur Radio Is On The Way Back

BY C.P. WEST*, W7EA

It was 9:45 p.m. in Beijing (Peking). We had 15 minutes to uncrate, put up antennas, hook up equipment, and be ready to demonstrate. That is the message we were given that eventful evening of September 6, 1981, by our Chinese interpreter Chang Li-ming. In accordance with our pre-arranged plans, Bill Showers, KC7CF, and Henry Oman, K7HO, handled the antenna installation; Bob Hudson, K7LAY, and I installed the station equipment. We were eagerly helped by the Chinese old timers and the Chinese Institute of Electronics (CIE) officials. The Telex Hy-Gain Model 18TD Tape Dipole antenna was installed on a balcony on the 11th floor of the new Yan Jing Hotel in Beijing, and the Drake TR-7 equipment was installed in a room on the first floor.

Bob and I removed the Drake TR-7 transceiver and power supply from the packing boxes and placed them on the desk. I unplugged the room TV power connector and tried to plug-in the TR-7. We had several types of adapters, but none of them worked. Chen Ke-Guong, formerly XU6CR, currently Director/Chief Engineer, Peking Second Radio Appliance Factory, joined me on the floor. We had two alternatives: either cut and swap plugs with the room TV set, or obtain some wire and make a couple of jumpers.

We selected the jumper-wire alternative, and ex-XU6CR did the work. He disconnected the room telephone and cut two wires, each about 4 inches long. He stripped the insulation from each end of each wire. I then made a twisted wire connection between the TV plug and the TR-7 plug and inserted the TV plug into the wall receptacle. About this time, someone handed me the business end of a coax cable through the window. This was plugged in. Bob turned the set on, adjusted the tuning, and *behold,* there was Bill Bennett, W7PHO, from Seattle coming in 5 by 9.

There was tremendous excitement in the room. Bob turned to our Chinese friends and said, "Who wants to take the microphone?" There were no takers! At an opportune moment, Bob called "W7PHO, W7PHO, here is K7LAY portable BY operating from the Yan Jing Hotel, Beijing, China. This is Bob at the mike. You are 5 by 9. Do you copy us, Bill? Over." There was tremendous excitement in the voice from Seattle: "Oh, my goodness! Is that you Bob? K7LAY, portable BY, this is W7PHO. You are 5 by 6 in Seattle. How long will you be on the air? Go ahead." Bob responded, "Probably just minutes, Bill, only just minutes. It's a demonstration, Bill, it's a demonstration only."

Our Chinese friends indicated that we should terminate the demonstration. Bob came on: "Bill, I have to sign. We have made the demonstration. W7PHO/W7FR, this K7LAY, portable BY signing. Good night Bill." Bill: "Ok, oh! No! No!" In W7PHO's log the frequency is 14.225 MHz, and the time is 1418Z (7:18 a.m., Seattle time) September 6, 1981. This demonstration QSO was heard around the world as evidenced by the many QSL/SWL cards received.

It all started in September of 1980 when I was fortunate to be a member of the IEEE Computer Society Technical Exchange to the Peoples Republic of China (PRC). During this visit, Chou Mengchi, Foreign Relations Branch, Chinese Institute of Electronics (CIE), and I became good friends. Also, a good friendship was established with Peng Chang-Cheng, son of the late General Peng of Korean War fame. I suggested to these gentlemen that amateur radio would be of great benefit to PRC for two principal reasons: it would provide technical training and would promote friendship for PRC with the world. I offered to lead a delegation to PRC to provide information on USA amateur radio activities and instructions.

Mr. Chou and Mr. Peng discussed this matter with their authorities in Beijing and later advised me that an invitation would be forthcoming. Subsequent to my return to the USA there was a lot of correspondence between the CIE and myself, resulting in a formal invitation.

The invitation requested a delegation of four people to discuss United States amateur radio. I decided to make our delegation a local affair so we could meet regularly to plan and practice our presentations to meet their requirements. Initially, we were instructed not to bring any equipment nor plan to operate in PRC. I

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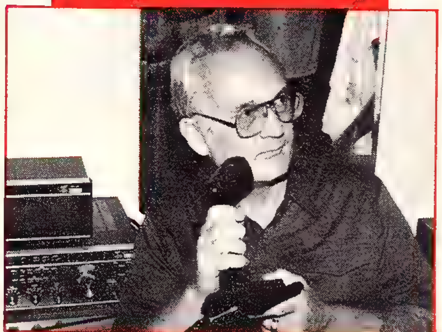

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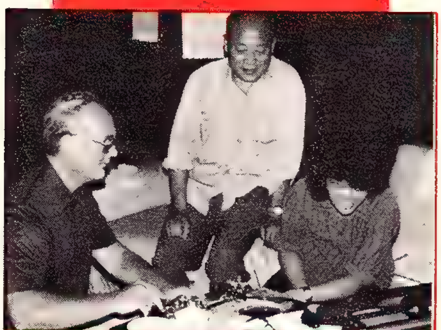

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(1) QSL card in commemoration of the initial USA amateur radio group visit to China in September 1981.

(2) American visitors, Chinese Institute of Electronics officials, and all China Radio Sport officials with Temple of Heaven in background, Beijing, PRC.

(3) Zheng Wenhao and Bill Bennett, W7PHO. Photo taken during the visit of Mr. Zheng to Seattle in October 1981. He was the principal contact of the USA group prior to and during their China expedition.

(4) Bill Showers, KC7CF, presents the fine Drake radios and Telex Hy-Gain antennas to Chen Ke-Guong, ex-XU6CR, Director, Chief Engineer, Beijing (Peking) Second Radio Appliance Factory. Mr. Chen was very helpful with our power connector problem for station K7LAY/BY.

(5) Bob Hudson, K7LAY, at the mike in hotel room in Beijing during the demonstration contact with W7PHO in Seattle on September 6, 1981. The Drake TR-7 and the Telex Hy-Gain 18TD tape dipole performed superbly. We planned ahead to initially use Bob's call "K7LAY/BY" so Bill Bennett in Seattle would recognize him.

(6) Neng Yun He, Director, Training, Chinese Institute of Electronics, with Tiananmin Gate to Forbidden City in background. Mr. Neng will have a leading role in the management of amateur radio activities in China.

(7) Bob Hudson, K7LAY, competes with China's c.w. champion—a woman! Photo taken at All China Radio Sport Association (Federation), Beijing. Bob thinks he may have lost this competition!

(8) Chen Renmu, ex-XU8ZM and C1ZM, operates station CIE in Beijing during the Shanghai to Beijing test on September 9, 1981. (Note the tape recorder.)

sought and obtained the sponsorship of the Boeing Employee's Amateur Radio Society (BEARS) and the Western Washington DX Club (WWDXC). The BEARS and the WWDXC are two of the more active ARRL affiliated clubs in the USA.

Bob Orr, WB7AZW, then President of the BEARS, and Ed Eckert, W7GRE, then President of the WWDXC, were firmly behind our expedition, and the Executive Committee of each club voted to sponsor it. Both clubs donated funds for the exclusive use of purchasing books and gifts. We paid our own way to/from China, and we were the guests of the Chinese government while in China.

Mary Lewis, W7QGP, ARRL Director, Northwestern Division, was very helpful. She arranged with ARRL Headquarters to supply is with the film "Wide Wide World of Amateur Radio." ARRL Headquarters also supplied a number of books equal to the ones we purchased from the ARRL with funds donated by our club sponsors.

A little personal data about the "China Four." We are all ARRL members and three of our group are life members. One member of our group has been licensed for over 45 years. Two of the four have been active in the IEEE for many years, and have been associated with the management of IEEE activities. Two of the four are life members of the WWDXC, and Bob Hudson, K7LAY, is currently President of this prestigious club. Three of our group are licensed Professional Communications Engineers and are quite proficient and experienced in virtually all areas of communications.

One month before the time we were to depart, I received a telegram from the CIE asking us if we could bring radios! Bill Showers, KC7CF, was assigned the task of obtaining equipment. Bill contacted Joe Brunzo, Sales Manager, R.L. Drake Company, and Kit Kitterer, W6AUF/Ø, of Telex Hy-Gain. Through the efforts of these two gentlemen, Drake donated two TR-7 stations and Telex Hy-Gain donated two 18TD Tape Dipole antennas. The 18TD was selected because we had no idea as to what frequency or frequencies they were interested in. The government office of Export Service in Washington, D.C., was notified and gave their approval for exporting this equipment to China.

Prior to our departure, our group met many times for several months to plan our presentations. Bob Hudson, K7LAY, was our Chief Radio Operator. Bob's presentation covered station equipment requirements and station operations. Bill Showers, KC7CF, presented the advantages of amateur radio and its rules and regulations. He was also responsible for training the Chinese hams on the TR-7 station. Henry Oman, K7HO, was responsible for special communications techniques such as RTTY, Satellite, Slow Scan, etc. He took along a small c.w. mountaineering set that proved to be a hit with the old-time ham operators. I served as master of ceremonies and also gave a slide presentation on Seattle and amateur radio stations in the Seattle area.

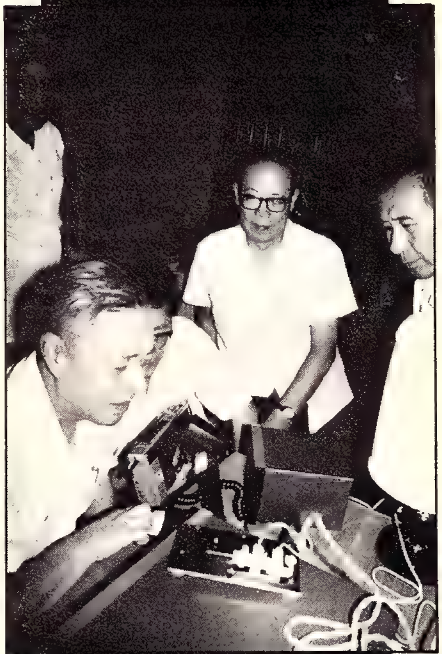
Gregory Tsang, a non-ham from Seattle, was most helpful to us in preparing for our trip and in PRC. In Beijing, he served as one of our interpreters and assisted in discussions with the PRC Government. Greg reads and writes excellent Chinese, and is very active in the Seattle Chinese community.

We left Seattle on September 2 via a Northwest Airlines 747 and stayed overnight in Tokyo prior to continuing on to Beijing via JAL. We required no alarm clocks in Tokyo, as we were awakened in the morning by an earthquake. We arrived in Beijing on September 4, at their National Airport, and were met by a delegation from CIE that included Zheng Wenhao, Director of Scientific and Technical Exchange, Neng Yun He, Director of Popularization (Education), and Chang Li-Ming, our Beijing CIE interpreter.

What followed was a whirlwind of meetings, presentations, tours, and banquets mixed in with informal hamfests and very little time for sleep. We visited the two major cities of China: Beijing, population 9 million, and Shanghai, population 12 million. Beijing is the political center, and Shanghai is the more modern manufacturing center. We all became quite proficient with chop sticks, as we insisted on eating delicious Chinese food.

There were many highlights during our visit. They included special hamfests with the old-time ham operators, our radio contact with Seattle, our visit with Ching Peng at the China national Radio Sports Commission, visits to cultural sites, banquets, etc., etc. But there was one special highlight: the Chinese amateurs we had trained in Beijing communicated with operators we trained in Shanghai! Bill Showers, KC7CF, did a great job of training the old timers on the Drake equipment. We observed this activity at the Jing Jiang Hotel in Shanghai.

The Shanghai old timers installed the equipment in the hotel with the antenna on the roof about 100 meters above the ground. The chief operator in Beijing was Chen Renmu. In 1936, he was XU8ZM, and his last call in 1945 was C1ZM. The chief operator in Shanghai was Y.C. Hsu, with old calls being XU8CH and C1CH. In Beijing, the call CIE was used, and in Shanghai, the call K7LAY was used again. We tried to get them to use our BEARS club station call, K7NWS, but we were advised that it was impossible to change now as they were only cleared to use the K7LAY call in Shanghai.



Y.C. Hsu, ex-XU8CH and C1CH, operates station K7LAY in Shanghai during the Shanghai to Beijing (Peking) test on September 9, 1981. (Note the tape recorder!)

This contact between two stations manned by old-time Chinese amateurs was heard by many stations. In Bill Bennett's log the time was 1430Z (7:30 a.m., Seattle time) September 9, 1981. The initial frequency was 14.250 MHz to get rid of some of the interference. The room was full of old timers and there was plenty of excitement. A special telephone circuit was set up between Beijing and Shanghai to coordinate things, with Greg Tsang manning the telephone in Beijing. The Chinese amateurs did all the operating. What an adventure!

On September 7, we departed Shanghai and China. We were the first USA amateur radio delegation to be officially invited to China by the PRC Government. As KC7CF stated, "We went, we saw, and we helped."

The Chinese old timers are anxious to communicate with United States hams. The following is a list of a few we met in Beijing and Shanghai. If you wish to correspond with any of these old timers write a letter or card to:

Henry Oman, K7HO, presents books to Shanghai old timers. Left to right: Qian Wheimin, interpreter; Shen Ming Gang, ex-C1MK and Director, Shanghai Institute of Electronics; and Henry. (Just a token number of books are shown. They were purchased by our sponsors.)

Shanghai:
c/o Shanghai Institute of Electronics
No. 47, Nanchang Road
Shanghai, Peoples Republic of China

Shanghai amateurs: C1CS, C1HT, C1KF, C1MK, C1PL, C1SP, C1SY, C1TH, C1TW, C1XU, C12ZM (since 1936), C1ZZ, C2CA (since 1935), XU8CH (C1CH), XU8EC, XU8SL (C1SL), and XU8YY

Beijing:
c/o Chinese Institute of Electronics
P.O. Box 139, Beijing
Peoples Republic of China

or

c/o China National Radio Sports Commission
Gymnasium Road No. 9, Beijing
Peoples Republic of China

Beijing amateurs: C1CT, XU2CK (C7CK), XU4CR, XU6CR, and XU8ZM (C1ZM)

Prior to our departure, we presented an overall management plan of detailed steps for China to follow to authorize, organize, and participate in amateur radio once again.

Amateur ingenuity is put to the test again as KB5SS demonstrates that just about everything can be recycled and improved upon.

Modifying The Mini-Quad B-24 Into A Three Element HQ-1

BY TOM OWENS*, KB5SS

"Hey, tell me what you did to your Mini-Quad?"

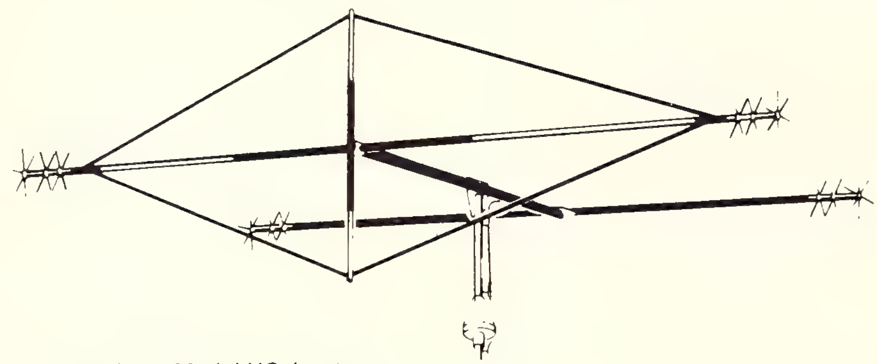
In the last two years this has been the question during many QSO's after I've mentioned my "modified HQ-1." The interest and excitement sparked by these sessions has made me aware of the keen interest in this little antenna and prospects of upgrading its performance.

I'm convinced that even in its "factory" configuration, the HQ-1 is a good antenna in any circumstances where size and mounting hardware are a limiting factor. However, for many of us the requirements of size and hardware are not quite so demanding, and just a "bit" more antenna could be accommodated if there was a corresponding increase in operating performance.

My interest in modifying my HQ-1 began when I accumulated a B-24 Mini Beam made by the same company as the HQ-1 (Mini-Products of Erie, PA). I acquired the B-24 from another ham's junk pile primarily with the intention of salvaging the traps as spares for my antenna—plus the price was right. That generous OM boxed it up and I paid the shipping!

Once I began to examine my "treasure," I realized what a potentially valuable find it was. The tubing was all intact, and even though the traps needed some work, everything was repairable. Most important, the factory assembly instructions were included, and they proved to be most interesting.

After repairing the traps, I wasn't content simply to store them for replacements. I knew I had the basic ingredients for that most prized of amateur accomplishments—a modification! I wrote to the factory for their opinion concerning the various kinds of modifications I envisioned, but to this day I haven't heard a word from them. Either they have not bothered to look into this matter, or they aren't promoting the idea of modifying their antenna. I finally grew tired of waiting for technical information, so being a "ham" at heart I began experimenting on my own.



Mini-Products Model HQ-1 antenna.

As I studied the assembly information for the B-24, I noted that it consists of a Yagi driven element and director. The HQ-1 consists of a quad reflector and a Yagi driven element. I soon decided that the easiest modification would be simply to take the director traps with their appropriate tubing and mounting hardware from the old B-24 beam and incorporate a third element onto my HQ-1.

I began by replacing the 54-inch boom of the HQ-1 with a 10-foot section of 1¼-inch, thin wall electrical conduit (available from any electrical supply outlet). I really believe that better performance can be obtained with a longer boom. All of the material I have read indicates that resonant bandwidth and F/B rejection are both affected by element spacing with an optimum of 0.2 wavelength between the reflector and driven element and 0.15 wavelength between the driven element and the director for any given band. By my estimate, an optimum array for 10 meters would require a boom of about 13 feet. I stuck with 10 feet for the boom length, since that was the readily available commercial length of the conduit, and it does not defeat the purpose of having a "mini" beam.

In order to mount the quad reflector on the new boom a hole had to be drilled to allow for the bolt that passes through the mounting stub and the boom, but that was the only modification that had to be made to the boom. I mounted the boom-to-mast plate at the middle of the boom, placed the driven element immediately forward of the plate, and then added the director at the end. This put just a bit more space between the reflector and driven element than between the driven element and the director, but on a boom this short it really doesn't matter much.

Since I moved the driven element from the end of the original boom to the middle of the new one, some changes had to be made. On the original, the feed line was attached by two bolts that passed down through the fiberglass mounting plate in front of the boom and connected directly to the elements like a simple dipole without any matching device. Since these bolts touched the boom when mounted in the middle and thus shorted the elements, I cut them off so that they would not protrude through the plate. I then simply secured the feed-line connections under the heads of the bolts on the top of the elements with the balun (a must for

*P.O. Drawer G, Fairland, OK 74343

the HQ-1) secured to the top of the plate. The director then was simply mounted at the end of the boom.

As simple as it sounds, that's all I did to the antenna, outside of the normal pruning of the capacitance spokes according to the instructions for the HQ-1. I then mounted the whole thing on top of a heavy-duty TV mast and rotor at about 32 feet.

As you already are well aware if you own an HQ-1, the resonant bandwidth and F/B rejection are the two weakest areas of the antenna's performance. Many people I have talked with had trouble getting the HQ-1 to resonate anywhere without a tuner. But by careful pruning of the spokes, my unmodified HQ-1 was resonant (below 1:2 s.w.r.) in all three phone bands. With the third element added and some repruning, I still have less than 1:2 on all three bands with almost 1:1 s.w.r. in the middle of each band. All in all, the resonant bandwidth doesn't seem to have been affected much. You still need a tuner to work both ends of the band, but that is also true for many other triband antennas.

The F/B ratio seems to be about three "S" units on my Kenwood TS-520 SE on 10 meters. That's not great, but it sure beats the two-element performance that sometimes seemed to work better off the back than the front.

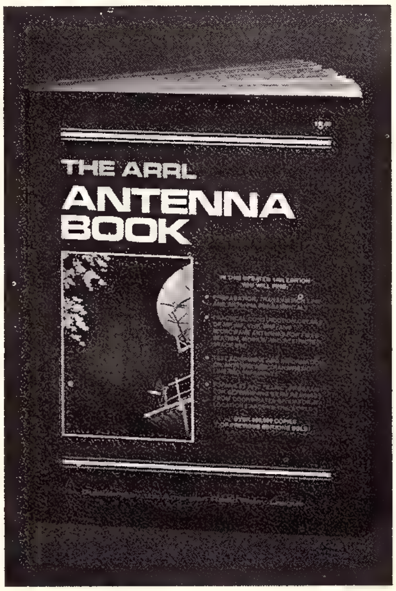
The real news of the modification for me is the increase in forward gain. I can't give hard evidence, except to note average signal reports from DX stations over the course of the two years I have been operating the modified antenna. I estimate that the third element has brought me about one "S" unit gain—not a lot, but enough to make the crucial difference when working a weak DX station.

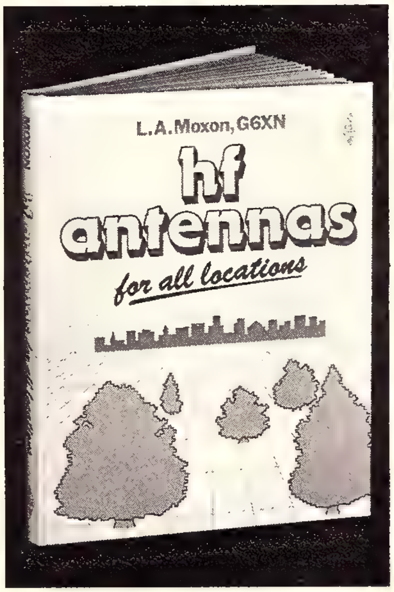
The only other change I made was to glue wooden dowel rods into the porcelain trap forms. I have had one trap break (the porcelain shattered) while the antenna was up. It is a helpless feeling to look up and see part of a trap dangling in the air held only by the wire of the loading coil! With the wooden rods glued in place there is something to hold the trap even if the porcelain breaks, and it does not seem to have affected the performance of the traps. I used a silicone glue which never hardens, and I also covered the director traps from the B-24 with the same material (since they were completely bare) to provide some weatherproofing.

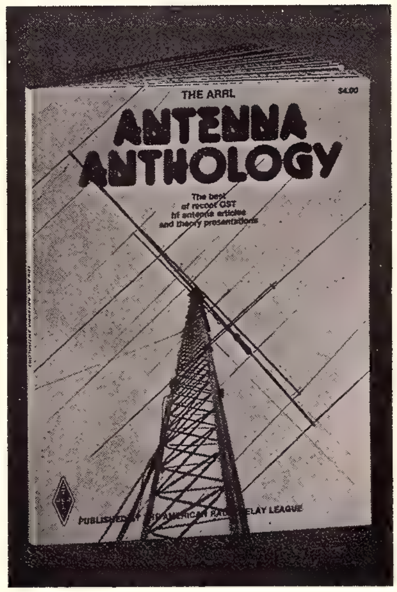
It isn't hard to tell that I'm pretty sold on this modification, but even discounting over-enthusiasm, I'm convinced that it is a worthwhile improvement. My cost amounted to the $5 to pay shipping on the "junked" B-24 and about $10 for the boom. New traps and mounting hardware purchased from Mini-Products could cost around $75, but I discovered quite a few hams around the country with old B-24's stuck somewhere. Look around in your neighboring ham's junk pile—you just might get lucky. CQ

BOOKS

"A STATION IS ONLY AS EFFECTIVE AS ITS ANTENNA SYSTEM"







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HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; The Antenna and Its Environment; Single-element Antennas; Hortizontal Beams; Verticle Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00**.

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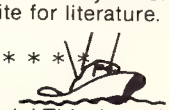

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Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Shortwave Listening—Part IV

This is a multi-part article about shortwave listening. The first three parts provide the introduction, plus coverage of the legality of eavesdropping, variety of transmissions, radio waves, selecting listening frequencies, publications, tapes, and clubs. This part contains information on equipment and accessories suppliers.

Stores

The yellow pages of local telephone directories usually include listings of stores that sell equipment and accessories needed by shortwave listeners. These suppliers may be listed under general headings such as amateur radio, communications, electronics, radio, and other related groupings. You should have little trouble finding stores that sell the supplies you need.

Magazines

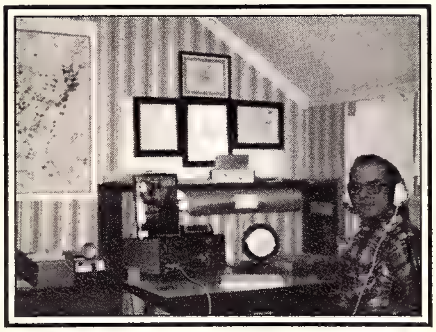
Major amateur radio publications contain advertisements from companies that manufacture and sell s.w.l. accessories, antennas, equipment, and publications. If you take time and carefully look through any issue of *CQ*, *Ham Radio*, *QST*, *Worldradio*, or *73*, several items of interest to s.w.l.'ers will be found.

Suppliers

Major manufacturers of equipment and accessories can be found in many local telephone directories. You may find that there is a nearby outlet that handles items of interest to you. If you want more information about suppliers, send an s.a.s.e. to the *CQ* office and they will send you a list of some of the suppliers that handle s.w.l. equipment.

Receivers

Quality. The single, most important item of equipment that will determine your ability to intercept radio transmissions is the receiver you use. Do not buy a receiver in the junk category, because poor listening results can quickly cause you to become discouraged. An experienced listener can do remarkably well with a poor receiver, but a newcomer to the s.w.l. ranks has enough trouble getting good results without being burdened with an unsatisfactory receiver. Get the best receiver your financial situation will allow you to buy.



Bill Vielhauber, KA2MUD, of Ogdensburg, NY, has been licensed since May of 1981, and he started operating one month after he received his Novice ticket. His contact total was 853 when I last heard from him, and 161 of those 2-way radio conversations were with DX amateurs in 42 countries. Bill has started collecting operating certificates, including the ARRL's WAS (Worked All States) award, which he earned in less than six months. His next major goal is to earn the prestigious DXCC (100 foreign countries) certificate. He has worked all continents and is just awaiting QSL cards before applying for the WAC award. His station includes a Yaesu 101-ZD transceiver and a 5-band Morgan ladder-type antenna. Bill is attending a licensing course at his local club, and he probably will have upgraded to General by the time this picture is printed. He is a 66-year-old retired carpenter and welder, a member of DAV Post 69, a member of the Ogdensburg Amateur Radio Club, the father of two daughters and three sons, and the grandfather of 13. Bill likes to ragchew (chat) on the air and he sends a QSL in response to each card received. He is particularly anxious to contact other stations with his "MUD" callsign suffix. Bill is a faithful reader of this column, and I can guarantee that he is active on the air; I worked him on 15 meters and on 10 meters.

Build or Buy? I do not advise beginners to build their first receiver. The major advantages stated in favor of building a receiver are pride of accomplishment and resultant improved ability to repair the receiver. I have done a lot of building, and I agree that there is an extra feeling of pride associated with operating equipment one has built. However, it is important that the equipment you build is really worth being proud of. If you decide to "homebrew" your receiver, I hope you will consider the following factors:

1. Few beginners have the knowledge, test equipment, and tools that are needed to do the job well.
2. New listeners need receivers that function well, and many "homebrew hearing aids" are not of good design.
3. Receiver construction articles are often incomplete and technically incorrect. Even if the article is good, you are likely to experience extreme difficulty in trying to locate the required parts. Most new builders quickly get the feeling that they have stepped into quicksand, and there is no easy way out of the predicament.
4. The cost of the parts needed to build a good receiver far exceeds the price of a better, second-hand, commercially manufactured receiver, or a kit.
5. Despite the time and cost related to homebrewing a receiver, it has practically no resale value. This is also true for kit receivers, but to a lesser degree.
6. The beginner does not usually have access to the test equipment needed to troubleshoot and align a homebrew receiver. Even if test gear is available, the newcomer probably does not know how to use it well enough to obtain maximum receiver performance. Also, very few radio service outfits are willing to work on homebrew equipment, except at unreasonably high charges.

Receiver Prices. The costs of new shortwave receivers vary from very low to extremely high. As an example, current Panasonic receivers I recently checked varied from a low of $80 (model RF085) to $2800 (model RF9000), with eight other

2814 Empire Ave., Burbank, CA 91504

models in the display being sold at prices between those two extremes. It is my opinion that decent receivers cost at least $150, good receivers cost more than $200, very good ones cost at least $400, and the best ones do not sell for less than $1000. Write to the manufacturers and distributors for current information. Evaluate the information received and directly compare features of every receiver being considered. Then, try the ones that seem to best fit your needs. Basically, you should get the best receiver you can afford to purchase. However, there are several receivers in the $200 to $500 price range that can provide excellent listening results without having to hock the wife and kids.

Choosing a Good Receiver. Picking a good shortwave receiver may seem to be confusing because there are so many different types on the new and used equipment markets. Despite the wide assortment, it is easy to choose a good receiver if you remember the "four S's"; a good shortwave receiver must be simple, stable, sensitive, and selective.

Receiver Simplicity. A beginner can easily become confused when trying to operate a receiver that has two or three

dozen controls. Worse than that, she/he may use these controls incorrectly, resulting in poor reception. As a general rule, if there are more than 15 controls on the front panel of a receiver, it has too many for a beginner. Modern receivers frequently have two controls mounted in tandem using concentric shafts; these should be counted as separate controls, not as one.

Receiver Stability. Receivers must be both mechanically stable and electrically stable, or you will "lose" stations, as they seem to shift frequency (drift).

Electrical Stability. Electrical stability should be checked first. Connect the receiver to an antenna, ground, and speaker. After the receiver has been allowed to cool off for at least two hours, turn it on and tune to WWV/WWVH (the American time and frequency standards stations) on 2.5, 5, 10, 15, or 20 MHz. Drift is usually most noticeable on the highest frequency band each receiver covers, so tune in WWV/WWVH at the highest frequency that it is heard on at your location. After the receiver has "warmed up" for about 10 minutes, check carefully to see exactly how far the dial (fiduciary) reading has to be changed as you again tune in WWV/WWVH at its new apparent frequency (usually, lower on the dial). Repeat this check at 10 minute intervals until no retuning is needed. If the receiver still needs to be retuned to WWV/WWVH after it has been on for 30 minutes, it has inadequate electrical stability. Use of a receiver that has poor electrical stability reduces your listening enjoyment by forcing you to continually tune in the stations, as your unstable receiver makes them seem to continually drift in frequency. If you already own a receiver which is electrically unstable, it is advisable to leave it on at all times to allow it to maintain its best possible degree of stability; just turn the r.f. and a.f. gain controls down when the receiver is not in use. It is often possible to leave a receiver in this ready position by just putting the standby/receive switch in the standby position when the receiver is not in use.

Mechanical Stability. Mechanical stability is easy to check. The receiver should be allowed to "warm up" thoroughly during the preceding electrical stability test. With the receiver still tuned to WWV/WWVH, tap the receiver front panel at several points and listen to see if the frequency "jumps." Strong taps may cause a slight shift, but light to medium taps should go unnoticed. Mechanical stability is no more important than electrical stability, because a mechanically unstable receiver just requires a more solid desk/table under it and extra care not to hit against it as one operates.

Receiver Sensitivity. Sensitivity is the measure of how well the receiver can pick up an extremely weak signal and process it to produce a good audio output for your listening pleasure. Most receivers lose capability very noticeably on their highest frequency band. It is best to compare two (or more) receivers on the highest band, using the same antenna switched between receivers. Just find a weak signal on one receiver and then find it on the other receiver as you compare reception across the dial. Repeat this comparison across each band (frequency segment) covered by the receiver you want to check out. Do not rely on "S-meter" readings when checking sensitivity, because they can be set to give vastly different readings, and they are commonly inconsistent even between identical receivers. Your ear is a suitable instrument to let you decide just how well different receivers perform in comparison with each other.

Receiver Internal Noise. A prime deterrent to good reception of weak signals is the noise which is generated within the receiver. This is easily checked by disconnecting the antenna, shorting the receiver antenna input terminals together with a piece of bare wire, and tuning the r.f. (radio frequency, sensitivity) and a.f. (audio frequency, volume) gain controls fully clockwise for maximum gain. With no signal input, the noise you hear is undesirable noise generated by the receiver. If this noise is loud, it will "drown out" extremely weak signals (during normal use) to the point where they will not be heard; even moderately strong signals will be adversely affected. Run this check on a few different receivers to learn how they compare with each other. Also, listen for noises and/or dead spots as you rotate each control fully up and down several times. Dirty potentiometers (gain controls) usually have to be replaced to restore a receiver to normal operation. It is often possible to restore a control to satisfactory performance by opening it and spraying it with a contact cleaner, but this may not be acceptable to a beginner.

Birdies. When you have finished checking receiver internal noise generation, you should run another check while no antenna is connected and the antenna terminals are short-circuited together. Internal processing frequencies can produce signals at one or more points in the frequency segments covered by the receiver. These inadvertent signals are called "birdies." Designers go to great lengths to avoid birdies, but it is extremely difficult to eliminate them entirely from sensitive receivers covering wide frequency ranges. Simply check for the presence of birdies as you carefully tune across each receiving segment. If there are no strong birdies in your important listening segments, the receiver should be acceptable for your use.

Receiver Selectivity. Selectivity is the receiver's ability to separate stations which are almost on the same frequency. Several receivers have steps (widths) of selectivity available to permit the listener to choose increasingly narrower band

segments when interference becomes objectionable. Unfortunately, the less desirable receivers lose too much of the signal strength as sharper (narrower) selectivity positions are used. Most shortwave listeners are primarily interested in amplitude modulation (a.m.) emissions, and these are received acceptably well using a selectivity bandwidth of 4 to 6 kHz. The use of a narrow bandwidth (sharp selectivity) reduces interference from static, as well as from other stations. Attentive listening will enable you to rate the performance of different receivers as you listen to the same station with each receiver. Select a relatively weak signal in a crowded portion of a band to check receiver selectivity; you're trying to find out what results you get under bad conditions. There is no sense in using a selectivity that is narrower than the width of the signal to be monitored. As an example, if one uses a selectivity of less than 6 kHz when listening to an amplitude-modulated signal, even some of the voice (speaking) characteristics will be lost.

Receiver Frequency Tuning

Many of the older receivers have both "coarse" (main) and "fine" (bandspread) tuning. The "coarse" tuning is used to tune to the approximate desired frequency, and the "fine" tuning is used to exactly tune in the desired station with relative ease. The fine tuning can be just a smaller air-variable capacitor connected in parallel with (across) the larger air-variable coarse-tuning capacitor. The fine-tuning capacitor must be positioned to the SET position (fully closed or opened) to let the coarse-tuning indication be as accurate as possible. If the fine tuning is not adjusted to the SET (reference) point, the coarse-tuning dial reading will be incorrect. Some fine-tuning capacitors are SET at maximum capacity (plates fully meshed). In this case, the coarse tuning is adjusted to a reading just below the desired frequency, and the fine tuning is adjusted (unmeshed) to tune up to the desired frequency. Most receivers have the fine-tuning capacitor SET at minimum capacity (plates unmeshed). In this case, the coarse tuning is adjusted to a reading just above the desired frequency, and the fine tuning is adjusted (meshed) to tune down to the desired frequency.

Fine-Tuning SET Points. The fine-tuning capacitor usually has a SET point clearly marked on its "bandspread" scale or scales. This point usually is also stated in the associated instruction manual. If you aren't sure whether you are tuning up or down in frequency with the fine-tuning control, you should quickly erase this doubt from your mind. Simply adjust this control to the indicated SET point and look inside the receiver to see whether the fine-tuning capacitor has its interlocking plates meshed or separated. If they are meshed, you'll be tuning up in frequency as you fine tune across the bandspread dial. If they are unmeshed, you'll be tuning down in frequency as you fine tune across the bandspread dial.

Coarse-Tuning SET Point. If the receiver has two or more bandspread (fine-tuning) dials, it will also have a corresponding number of SET points for your coarse-tuning dial. If this is the case, your fine-tuning dial is marked in frequency for each band or SET point to indicate the frequency as you tune (up or down) from the frequency selected with the coarse-tuning dial. Realize that you can use this fine-tuning function anywhere once you know what you're doing with this control. You just have to ignore the bandspread-dial frequency readings when you are not starting from the usual coarse-tuning SET point.

Digital Readout. Many modern receivers include a frequency counter which is used to provide an LED (light emitting diode) or LCD (liquid crystal display) direct frequency readout. This system is easier to use and provides more precise frequency tuning than is possible with an analog-type dial reading. Digital readout is particularly helpful to new listeners since it visually displays the listening frequency at all times, minimizing the possibility of tuning errors.

Instruction Manuals. It is very important that you fully understand the exact function of each control on your receiver. If you did not get an instruction manual with your receiver, it is well worth the expense and trouble to buy one from the equipment manufacturer. If you don't know the address to use, you should be able to get it from ads in current electronic magazines. If everything else fails, you can get the address from the *Thomas Register* in your local public library, or in your company's purchasing department. Local electronic stores can usually provide such addresses, if they want to help. Once you have the instruction manual, use it. Set up your receiver and sit down in front of it with your manual open to the pages that detail the function of each control. Turn your receiver on, tune it to a dependable station (such as WWV), and use each control to hear what it does to the received signal after first reading what function each specific control performs. Your instruction manual can prove to be a good friend. Like all good friends, it deserves frequent visits and understanding to be fully appreciated.

Part IV, Conclusion

This completes the fourth part of this article about shortwave listening. Part V will cover loudspeakers, earphones, antennas, and ground.

73, Bill, W6DDB

a regular feature by

THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

CATV Operators Face Opposition To Use Of Channels "E" And "K"

Reports in *Westlink* indicate that cable TV (CATV) operators around the nation are facing increasing resistance to their use of cable channels "E" (145.25 MHz) and "K" (223 MHz). In particular, the following recent actions have taken place:

- Storer Cable TV, Thousand Oaks, CA, gave up use of channel "K" following efforts lead by Mark Gilmore, WA6RHK, and the members of the Condor Repeater Association.
- Teleprompter Corporation faces opposition from amateurs in Torrance, CA, regarding their use of channels "E" and "K." Here, the fight is being led by members of the Hughes Aircraft Company's Amateur Radio Club.
- Cablevision Corporation, Lincoln, NB, may be forced to vacate channel "E" if the City Council takes the advice of the Cable TV Advisory Board in that city.

The direction is clear . . . if amateurs are going to protect their v.h.f. bands from r.f.i. produced by leaky CATV systems, coordinated moves will be required to eliminate CATV operations on channels "E" and "K." And the time to make such moves is during the local planning process, before the CATV franchise is awarded.

Finally, amateurs should not forget that operations on CATV channels "UU" (421 MHz), "VV" (427 MHz), "XX" (439 MHz), and "YY" (445 MHz) pose a threat to our 420–450 MHz u.h.f. band.

Government Gets Tough With Rule Violators

Earlier this year, Administrative Law Judge Edward J. Kuhlmann *denied* the applications of Gary W. Kerr for renewal of amateur radio station license WA6JIY and a General Class amateur radio operator license.

These actions stemmed from hearings into alleged interference to the Grizzly Peak repeater from the operations of WA6JIY (this repeater extends coverage beyond the mountains shielding the California Central Valley). Specifically, in August 1980, the Commission began receiving complaints at its Livermore Monitoring Station from amateurs that the Grizzly Peak repeater was unusable because Mr. Kerr was jamming the input frequency. The Commission, in response to the complaints, monitored the frequencies assigned to the repeater and recorded Kerr's transmissions. The Commission's technician observed that during Kerr's operations—operations ostensibly conducted for the purpose of "audio tests"—other operators were unable to use the repeater.

The judge determined that the Kerr transmissions were not a test of anything except maybe the patience of his fellow amateur operators who were unable to use the Grizzly Peak repeater. Further, there was no indication that Mr. Kerr was actually conducting tests. Thus, the licensee, in the judges opinion, " . . . demonstrated that a renewal of his amateur licenses would not serve the public interest, convenience, and necessity."

In a related action, Judge Kuhlmann revoked the amateur radio station license of Donald E. Gilbeau and affirmed suspension of his amateur Extra Class radio operator license. Gilbeau, too, was found to have interfered with the operation of the Grizzly Peak repeater; this operator, however, disrupted the repeater's operation by transmitting random words, Morse code, and unintelligible sounds on the system's input frequency.

R.F.I. Cases Still Over 80,000 Per Year On An Annualized Basis

Jeffrey Young, Enforcement Division, FOB, FCC, reports that during the second quarter of FY82 (January, February, and March 1982), r.f.i. complaints to the Commission totaled 20,943. This is slightly higher than the number reported in the first quarter, and it suggests that on an annualized basis, complaints still number over 80,000 per year.

Of the 20,943 complaints received, 17,267 (or 82%) involved a television receiver as the victim device. Of these, CB operations were alleged to be involved in 11,944 cases of t.v.i., while amateurs were cited in 617 cases.

In all, CBers were alleged to be involved in 13,263 r.f.i. complaints, while amateurs accounted for 1,019. Complaints by amateurs against other amateurs totaled 280, down from the 362 cases reported in the first quarter.

Electronic Home-Entertainment Manufacturers Continue To Blame Hams For R.F.I.

Amateurs purchasing new electronic home-entertainment equipment—and, specifically, television receivers—are urged to read carefully the instruction book that comes with the set. Why? Consider the quotes below, which were taken from the instruction book published by a major American manufacturer of color TV receivers:

"Interference . . . can be caused by . . . CB or other amateur radio transmitters . . ."

"This is not the fault of your TV set."

It is well recognized that most problems with so-called television interference (t.v.i.) result from front-end overload of the TV set's tuner. Thus, the inclusion of statements such as those above in an instruction manual can only mean that the manufacturer is *knowingly* blaming radio operators for problems that result from design deficiencies in the TV set.

Owners of electronic home-entertainment equipment having instruction manuals blaming amateurs for interference

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problems are urged to file complaints with the manufacturer and the ARRL. Further, it is suggested that the ARRL RFI Task Group delist manufacturers who persist in duping the public as to the real villain in this matter. In the instant case, the manufacturer involved recognizes that filters for his TV and audio products may be required, and states that he will honor requests for such filters (Radio Frequency Interference, ARRL, 1981). Yet, no such statement appears in the instruction manual.

Amateurs Participate In Development Of Emergency Communication Capabilities

According to *Signal* magazine (Journal of the Armed Forces Communications and Electronics Association, or AFCEA), the Northwest Region Wartime Planning Resources Panel recently developed networking communication capabilities for use in emergency situations. The need for such capabilities became apparent after the eruption of Mount St. Helens, when it was found that no emergency plan existed for logistics or communications. In the northwest region (Washington, Oregon, Idaho, northwestern California), as in other areas, redundant (network) communications are necessary if the government is going to survive major disasters, including war.

In the northwest region, system redundancy is based on the use of h.f., v.h.f., u.h.f., and mobile communications, among other things; there is no dependence on rerouting of telephone circuits.

The northwest region plan was developed by the North American Aerospace Defense Command at McChord AFB, WA, with the help of the Federal Emergency Management Agency (FEMA), the National Oceanic Atmospheric Administration (NOAA), the other military services, and amateur radio operators. Initial tests for the plan are expected to take place early in 1983.

American Public May Have To Obtain Shuttle Information From British Amateurs

According to an article in the *Daily Hampshire Gazette,* "the Air Force may put the American public in the position of getting information about the shuttle from a group of British amateurs."

This quote, attributed to a NASA official, resulted from the Air Force's recent proposal to make orbit and altitude information on future shuttle flights secret, and from the observation that British amateurs have for years monitored Soviet space flights with ease. The AF ban on flight information will begin when Columbia is used to launch military cargo; this is expected on the shuttle's fourth flight sometime this summer. Officials of the Department of Defense fear that information on flight altitudes and orbital paths could provide clues as to the type of military satellites being launched.

In particular, NASA and Air Force officials propose:

- to carefully control all air-to-ground conversations;
- to restrict television coverage from space to ensure that no pictures of military hardware are aired;
- to withhold details about shuttle maneuvers.

If the Air Force plan for classifying shuttle flight data is implemented, the public may indeed have to turn to the amateur community for its information!

FCC Cracks Down On Pirate Broadcasters

According to Richard Smith, Chief, Field Operations Bureau (FOB), FCC, the Commission, earlier this year, closed down six unlicensed broadcast stations operating in the commercial a.m. and f.m. bands. All of the stations were located in the greater New York/Long Island area. In some cases, the operators paid forfeitures of up to $2000. "The use of forfeitures," said Smith, "speeds the resolution of such cases."

The equipment used by the pirate broadcasters varied over a wide range. Transmitters were generally not very sophisticated, and in many cases, converted military or homebrew systems were used. The equipment at most stations, however, was of professional quality.

Aside from the fact that the stations were unlicensed, the transmissions from some posed a threat to safety-of-life services. Said Joe Casey, Chief, Investigations Branch, Enforcement Division, FOB, "Spurious emissions from some of the broadcasters were showing up in the aviation bands."

While most of the pirate broadcasters ceased operation following the imposition of forfeitures, a few continued to operate in defiance of the Commission. These operators will face legal action in Federal court, and such proceedings will undoubtedly be underway by the time this issue is mailed.

Finally, it is interesting to note that pirate broadcasting in the commercial TV band is also becoming a problem. Earlier this year, for example, the Commission shut down at least three low-power television stations whose operators had apparently grown impatient with FCC delays in licensing low-power TV operations.

National Science Center For Communications And Electronics To Open In 1984

With the opening of the National Center for Communications and Electronics in 1984, Fort Gordon, GA, will enter the world of 21st century communications. A

spectacular complex of dynamic, interactive exhibits will present the future of communications technology as never before seen. The Signal Corps soldiers of Fort Gordon, together with visitors from across the nation, will be able to see science and technology come alive in displays that encourage visitor involvement and stimulate a desire to learn. As a major component of the Signal Center, the National Science Center is also committed to preserving the 120-year history of the Signal Corps.

The National Science Center will incorporate four main components: a main exhibit, display modules, an Omnitheater, and a Learning and Information Network Center. Through the display modules presented, an informal learning atmosphere will be created that will teach scientific principles by functional exhibits.

Top executives in the communications and electronics industry, together with senior retired military personnel from across the nation, have combined their talents in planning a true monument to the Signal Corps, and to the sciences of communications and electronics. Through major financial commitments totalling over a million dollars, the National Science Center is well on its way to focusing the attention of the world on Fort Gordon as the professional home of all communicators.

How To Obtain Part 97 Of The Commission's Rules

Obtaining Part 97 of the Commission's Rules (which addresses the amateur service) has become something of a problem. Even if you were able to locate a separate copy of these Rules, you would probably find that they are out of date.

A more up-to-date version of Part 97, according to John Johnston, Chief, Personal Radio Branch, Private Radio Bureau, can be found in the Code of Federal Regulations, Title 47, Vol. 4, Parts 80–end. This volume was published in October 1981, and is available for $8.50 from all Government book stores.

House Bill Amended To Include Provisions Of Goldwater's R.F.I. Bill

According to Scott Johnson, Legislative Assistant to Congressman Swift (D, WA), the provisions of Goldwater's so-called "R.F.I. bill" (S 929) have been incorporated into the FCC's "Track 1" (noncontroversial) legislation. The r.f.i. provisions were offered as an amendment to HR 5008 by Swift during mark-up of the bill in the House Telecommunications Subcommittee.

Some resistance to including r.f.i. legislation in the bill came from congressmen who felt such provisions would increase Federal regulation at a time when the Administration was attempting to deregulate in all areas. However, supporters pointed out that the provisions represented "enabling" legislation. That is, the bill, if passed, would only give the FCC the authority to set susceptibility standards for electronic home-entertainment equipment. The bill, however, does not specify such standards, nor does it require the Commission to set standards.

In another action on HR 5008, attempts to eliminate provisions on the delicensing of CB failed. There is still the chance, however, that CB delicensing will be eliminated later in the legislative process.

Following completion of the Telecommunication Subcommittee's work, HR 5008 was sent to the House Energy and Commerce Committee for hearings. If the bill survives in this committee, the next step will be to bring legislation to the full House.

Your Washington editor thanks the Regional Director, FCC, San Francisco, CA, for his contributions to this and earlier columns. The contributions of Dave Beauvais, KB1F, are also appreciated.

1982 CQ WW WPX S.S.B. Contest High-Claimed Scores

The following are early-bird S.S.B. high-claimed scores as of April 1982. These are raw scores subject to verification.

USA

SINGLE OPERATOR ALL BAND

AB0I	4,107,378
K7RI	4,067,140
K2SS	3,270,838
AI9J	3,080,960
AK1A	2,463,120
KO8T	1,746,960
N7RO	1,434,529
NE6I	1,158,472
N8BJQ	1,062,160
KF2O	995,125

28 MHz

KG1E	2,587,680
AA4VK	1,585,488
W8UA	1,346,880
KC2X	1,201,536
AG7M	1,128,435

21 MHz

AI7B	3,951,630
KC7EH	900,240
KR8K	643,720
KB7G	547,459
KB0C	479,142

14 MHz

K8NA	2,284,475
N7DF	1,114,528
K1NG	843,771
W7FP	354,750
W6CN	181,260

7 MHz

N6RO	884,740
N5JJ	532,656
K7UR	483,817
KC8JH	172,608
AJ7S	152,152

3.8 MHz

KO6G	282,864
KN8R	136,030
KA3R	55,384
K5BZU	52,052
N1BMV	36,168

1.8 MHz

W8LRL	16,576
K2BQ	10,192
W3BGN	4,488
WD9AHJ	3,564
K8CFU/4	1,600

MULTI-SINGLE

KJ9W	6,183,582
AI6V	5,771,700
K4VX/0	3,823,071
K2BA/4	3,644,784
KK5I	3,338,810
W9LT	2,834,528
AB6R	2,518,992
WB9GGD	2,149,564
AK0A	1,926,020
KB2MG	1,860,252

MULTI-MULTI

AD8R	8,450,166
KQ8M	8,172,392

QRPp

W8ILC	AB	1,072,764
AG3H	AB	434,313
WD8IDD	28	142,208
N1BZG	28	85,833
N3KZ	14	81,012

DX

SINGLE OPERATOR ALL BAND

KH6XX	6,242,967
VE6OU	5,252,808
GB4DX	5,222,725
P42J	4,571,988
VP2MGQ	4,456,634
CN8CO	3,604,992
EA3WZ	3,005,224
JI1QPU	2,155,964
6D5ZZA	2,009,889
PP2ZDD	1,937,680

28 MHz

KB7IJ/KH2	4,762,472
CN8CY	2,947,811
KH6MD	2,460,816
CP6EL	1,009,423
HC1EA	854,226

21 MHz

JR1WHW	1,054,391
JF2IWL	321,475
4Z4VG	283,815
JR4BSM	250,275
TG9WB	206,040

14 MHz

KG6DX	2,860,188
TG9GI	2,066,625
CU5UA	1,245,132
XK5AE	189,875
JM1LPN	173,470

7 MHz

FG0DYM/FS	1,498,488
YV3AZC	1,478,576
HC1HC	818,216
HA9RE	529,312
VK3AKK	380,380

3.8 MHz

K0CS/VP9	679,098
NP4CC	237,048
ON5WL	93,058
OK3IAG	57,456
LA5QK	30,300

1.8 MHz

VE3BBN	24,922

MULTI-SINGLE

VE1DXA	8,395,926
XK5XK	7,775,222
UK6APA	7,168,293
PA2TMS	6,091,159
SL0ZG	5,942,385
JH7YJF	5,486,169
WL7E	5,265,944
LG5LG	4,261,260
XK5GF	3,645,460
ZL0AEO	3,162,555

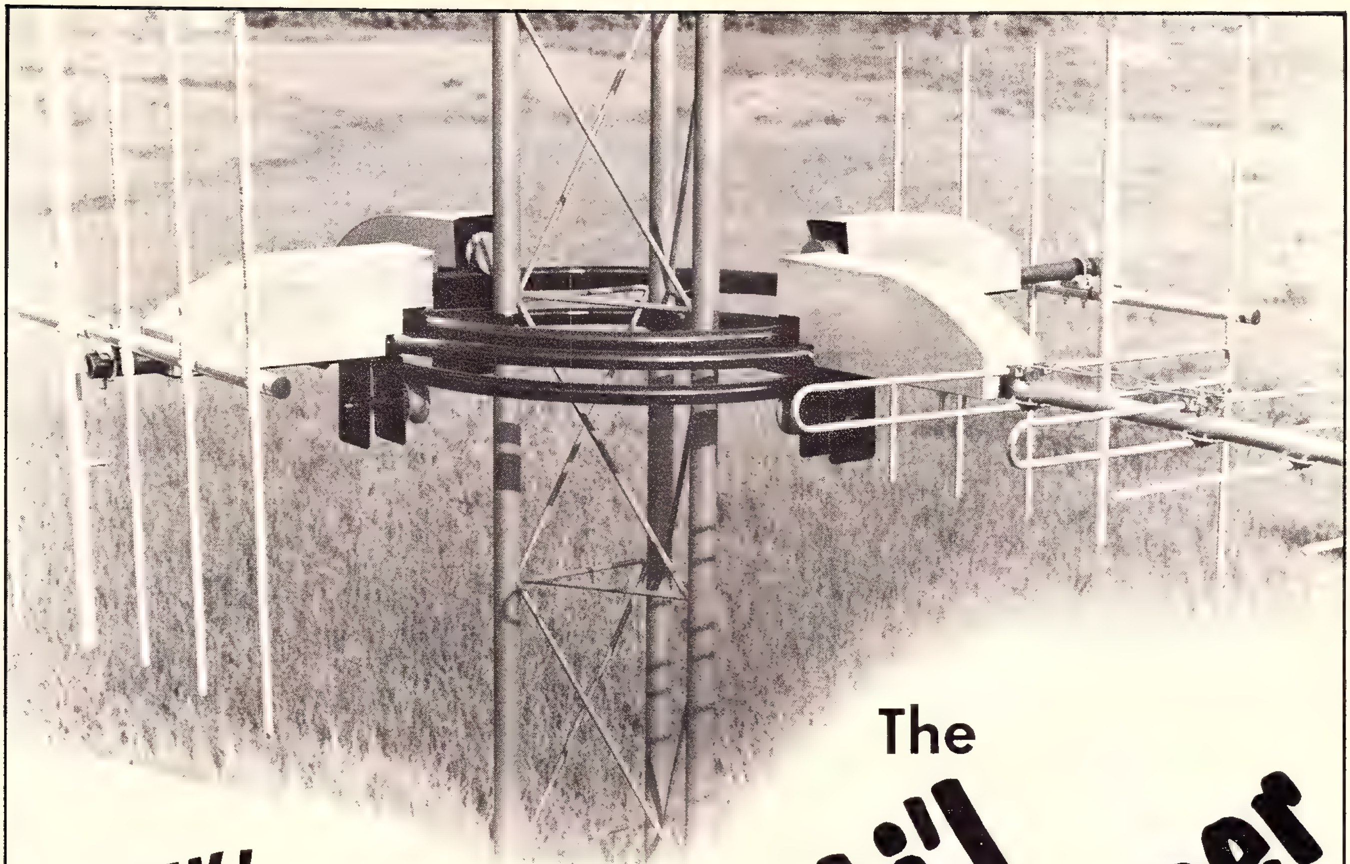
MULTI-MULTI

KL7RA	14,749,500
KL7IRT	12,074,096
VE7ZZZ	8,354,304

QRPp

4T8CW	AB	323,632
G3VOF	28	145,780
SM6HQK	21	22,936
I0OAY	14	38,829
ON6NL	3.8	1,250

(**NOTE:** Queries pertaining to the WPX Contest should be sent to either Bernie Welch, W8IMZ, or Steve Bolia, N8BJQ.)



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CIRCLE 104 ON READER SERVICE CARD

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The present sunspot cycle continues to remain stalled at the 142 mark!

The Sunspot Index Data Center at the Royal Observatory of Belgium reports a monthly mean sunspot number of 122.5 for April 1982. This results in a 12-month running smoothed sunspot number of 142.1 centered on October 1981. The present cycle has remained in the 140–143 range for 11 consecutive months. This is an added bonus from Mother Nature to radio amateurs, since the continuing high level of solar activity assures exceptionally good conditions on the h.f. bands.

A smoothed sunspot number in excess of 120 is forecast for August 1982.

August Propagation

Late August and early September is the time of year when propagation forecasters usually like to hide! This is generally the most difficult period for which to make accurate h.f. predictions, because conditions can change drastically from day to day.

On some days, typical summertime conditions will occur on the h.f. bands, much as they were in June and July. On other days, they will sound more typically fall-like, with higher daytime frequencies and lower usable frequencies at night.

Since August and September are times of transition on the h.f. bands, this month's DX Propagation Charts cover only the one-month period from August 15 through September 15, rather than the usual two-month span. Short-Skip Charts for use during August appeared in last month's column.

During the hours of daylight expect good DX conditions on three bands: *10, 15,* and *20* meters. Of the three, conditions should be best on *15* meters, with peak conditions expected to most areas of the world during the afternoon hours. An increasing number of *15* meter openings towards Europe and the east should also be possible before noon.

While the *20* meter band should be open for DX to one area of the world or another throughout most of the daylight hours, peak signals are expected during an approximate two-hour period immediately following sunrise, and again during the late afternoon.

Some fairly good DX openings should also be possible on *10* meters during the hours of daylight, particularly along an arc extending across central Africa, Latin America, and into the Far Pacific area. Peak conditions should occur during the afternoon hours, but an increasing number of earlier openings should be possible by early September.

Between sundown and midnight, good DX conditions should be possible on the *15, 20, 40,* and *80* meter bands. *Fifteen* meter openings will mainly be towards Latin America, the Far Pacific, and into Asia. Openings on *20* meters are expected to be somewhat broader, with peak conditions towards the south and west, but openings also are possible to most other areas of the world. Before midnight, openings on *40* and *80* meters should peak towards the east and south along an arc extending from northern Europe, through Africa, and into Latin America.

From midnight to sunrise, expect *40* meters to be the optimum band for DX, followed by *80* meters and *20* meters. Conditions should peak for openings towards Latin America, the Far Pacific, and Asia.

By late August, static levels should have decreased to a point where some *160* meter DX openings may be possible during the hours of darkness. Conditions on this band, as well as on *40* and *80* meters, will tend to peak just as the sun begins to *rise* on the *light,* or easternmost, terminal of a path.

For *short-skip* openings during August and September, try *80* meters during the day for distances less than *250* miles, with *40* meters as a backup. During the hours of darkness, both *80* and *160* meters should provide excellent communication over this distance.

For openings between *250* and *750* miles, try *40* meters during the daytime for distances up to 500 miles, and *20* meters between 500 and 750 miles. At night, *40* meters should be optimum for this distance until midnight, with *80* meters best from midnight to sunrise.

Twenty meters should provide optimum propagation conditions during the daylight hours for openings between *750* and *1300* miles. Between sundown and midnight, *40* meters should be best for this distance, with *20* meters as a backup. Try *40* meters from midnight to sunrise, with *80* meters as an alternate.

For openings between *1300* miles and the one-hop, short-skip limit of approximately *2300* miles, use *20* meters during the day, with *15* meters also usable. After sundown, try *40* meters, with *80* meters as an alternate for this distance range.

Although short-skip openings produced by sporadic-*E* ionization should decrease considerably during August, some openings on *10* meters between approximately *400* and *1300* miles should be possible, particularly during the daytime hours. Longer skip openings, up to the one-hop limit of 2300 miles, are expected to increase in occurrence during August.

11307 Clara St., Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for August 1982

	Expected Signal Quality			
Propagation Index........	(4)	(3)	(2)	(1)
Above Normal: 4, 17, 25, 31	A	A	B	C
High Normal: 2-3, 5-6, 13-14, 16, 19, 22, 24, 26, 29	A	B	C	C-D
Low Normal: 1, 7-8, 12, 15, 18, 20-21, 23, 27-28, 30	A-B	B-C	C-D	D-E
Below Normal: 9, 11	B-C	C-D	D-E	E
Disturbed: 10	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9 + 30 dB.

B—Good opening, moderately strong signals varying between S9 and S9 + 30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good-to-fair (B-C) on Aug. 1st, good (B) on the 2nd and 3rd, excellent (A) on the 4th, etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, David D. Meisel, Editor, 54 Westview Crescent, Geneseo, NY 14454.

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. wetc. Appropriate *daylight* time is used, *not* GMT. T convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

6. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado, 80302.

August 15 - September 15, 1982
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-15 (1)	08-10 (1) 10-15 (2) 15-18 (3) 18-19 (2) 19-20 (1)	09-15 (1) 15-16 (2) 16-18 (3) 18-23 (4) 23-03 (3) 03-05 (2) 05-07 (3) 07-09 (2)	19-20 (1) 20-21 (2) 21-22 (3) 22-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 20-21 (1)* 21-22 (2)* 22-00 (3)* 00-01 (2)* 01-03 (1)*
Northern Europe & European USSR	12-15 (1)	08-10 (1) 10-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	09-14 (1) 14-16 (2) 16-19 (3) 19-20 (2) 20-22 (1) 22-01 (2) 01-06 (1) 06-09 (2)	20-21 (1) 21-22 (2) 22-00 (3) 00-01 (2) 01-03 (1) 21-02 (1)*
Eastern Mediter-ranean & Middle East	12-16 (1)	08-10 (1) 10-13 (2) 13-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	07-09 (2) 09-16 (1) 16-17 (2) 17-20 (3) 20-23 (4) 23-00 (3) 00-02 (2) 02-07 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	12-17 (1) 17-19 (2) 19-20 (1) 11-16 (1)**	08-10 (1) 10-15 (2) 15-17 (3) 17-21 (4) 21-23 (3) 23-01 (2) 01-03 (1)	13-16 (1) 16-17 (2) 17-19 (3) 19-02 (4) 02-04 (3) 04-06 (2) 06-09 (1)	19-21 (1) 21-02 (2) 02-03 (1) 22-01 (1)*
Eastern & Central Africa	16-17 (1) 17-19 (2) 19-20 (1)	09-12 (1) 12-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	13-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-00 (3) 00-02 (2) 02-05 (1)	21-01 (1)
Southern Africa	09-11 (1) 11-15 (2) 15-17 (1) 10-15 (1)**	08-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-08 (2) 08-15 (1) 15-18 (2) 18-21 (3) 21-22 (2) 22-00 (1) 00-03 (3) 03-04 (2) 04-06 (1)	21-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	10-12 (1) 20-22 (1)	09-10 (1) 10-12 (2) 12-13 (1) 18-20 (1) 20-22 (2) 22-23 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1) 20-22 (2) 22-02 (1)	06-08 (1) 20-22 (1)
Southeast Asia	18-21 (1)	09-12 (1) 12-16 (2) 16-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-21 (1) 21-23 (2) 23-02 (1)	06-08 (1)
Far East	18-20 (1)	09-11 (2) 16-18 (1) 18-20 (2) 20-22 (1)	17-20 (1) 20-22 (3) 22-00 (2) 00-05 (1) 05-06 (2) 06-08 (3) 08-10 (2) 10-12 (1)	05-08 (1)
South Pacific & New Zealand	09-14 (1) 14-18 (2) 18-20 (3) 20-21 (2) 21-22 (1) 15-18 (1)**	09-10 (1) 10-12 (2) 12-16 (1) 16-18 (2) 18-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-01 (1)	14-20 (1) 20-22 (2) 22-01 (3) 01-04 (4) 04-05 (3) 05-06 (2) 06-09 (3) 09-10 (2) 10-12 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	09-10 (1) 10-11 (2) 11-12 (1) 16-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	05-08 (2) 08-10 (3) 10-12 (2) 12-17 (1) 17-19 (2) 19-22 (1) 22-01 (2) 01-05 (4)	03-04 (1) 04-07 (2) 07-08 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (3) 15-18 (4) 18-19 (2) 19-21 (1) 11-14 (1)** 15-17 (1)**	07-08 (1) 08-09 (2) 09-12 (4) 12-14 (3) 14-21 (4) 21-22 (3) 22-23 (2) 23-01 (1)	06-07 (3) 07-10 (4) 10-11 (3) 11-15 (2) 15-17 (3) 17-03 (4) 03-05 (3) 05-06 (2)	19-20 (1) 20-21 (2) 21-23 (3) 23-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 22-23 (1)* 23-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile Argentina & Uruguay	08-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-11 (2) 11-15 (1) 15-16 (2) 16-18 (3) 18-22 (4) 22-00 (3) 00-01 (2) 01-02 (1)	10-16 (1) 16-18 (2) 18-19 (3) 19-02 (4) 02-04 (3) 04-07 (2) 07-09 (3) 09-10 (2)	20-21 (1) 21-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 22-00 (1)* 00-04 (2)* 04-06 (1)*
McMurdo Sound, Antarctica	11-14 (1)** 16-18 (1)** 17-18 (2) 18-19 (1)	12-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	16-19 (1) 19-22 (2) 22-02 (3) 02-05 (2) 05-08 (1) 07-09 (1)	01-05 (1)

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	10-13 (1)	09-10 (1) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	08-13 (1) 13-16 (2) 16-17 (3) 17-21 (4) 21-23 (2) 23-01 (1) 04-06 (1) 06-08 (2)	19-21 (1) 21-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 20-22 (1)* 22-00 (2)* 00-02 (1)*
Northern & Central Euorpe & European USSR	11-13 (1)	09-10 (1) 10-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	01-06 (1) 06-09 (2) 09-12 (1) 12-15 (2) 15-18 (3) 18-19 (2) 19-22 (1) 22-01 (2)	19-20 (1) 20-00 (2) 00-02 (1) 21-00 (1)*
Eastern Mediter-ranean & Middle East	11-13 (1) 15-17 (1)	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-16 (1) 16-18 (2) 18-22 (3) 22-00 (2) 00-02 (1)	20-23 (1) 21-22 (1)*
Western Africa	10-14 (1) 14-17 (2) 17-18 (1) 10-15 (1)**	07-10 (1) 10-13 (2) 13-15 (3) 15-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-00 (4) 00-02 (3) 02-04 (2) 04-06 (1)	19-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Eastern & Central Africa	14-16 (1) 16-18 (2) 18-19 (1)	10-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-15 (1) 15-18 (2) 18-19 (3) 19-21 (4) 21-23 (3) 23-00 (2) 00-02 (1)	20-00 (1)
Southeast Africa	09-11 (1) 11-13 (2) 13-15 (1) 11-13 (1)**	08-09 (1) 09-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-17 (2) 17-18 (1)	06-08 (2) 08-15 (1) 15-16 (2) 16-19 (3) 19-21 (2) 21-23 (1) 23-03 (2) 03-06 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-00 (1)*
Central & South Asia	09-11 (1) 19-21 (1)	08-09 (1) 09-10 (2) 10-11 (1) 18-19 (1) 19-21 (2) 21-23 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-11 (1) 17-19 (1) 19-22 (2) 22-02 (1)	05-08 (1) 19-21 (1)
Southeast Asia	12-14 (1) 17-19 (1)	08-09 (1) 09-12 (2) 12-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-13 (1) 18-20 (1) 20-23 (2) 23-00 (3) 00-01 (2) 01-02 (1)	05-08 (1)
Far East	16-20 (1)	08-10 (1) 13-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	19-22 (1) 22-23 (2) 23-01 (3) 01-03 (2) 03-06 (1) 06-07 (2) 06-09 (3) 09-11 (2) 11-13 (1)	03-06 (1) 06-07 (2) 07-08 (1) 06-07 (1)*
South Pacific & New Zealand	10-12 (1) 12-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-21 (2) 21-22 (1) 14-18 (1)**	07-11 (1) 11-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-02 (1)	07-09 (4) 09-10 (3) 10-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-02 (4) 02-04 (3) 04-07 (2)	23-00 (1) 00-01 (2) 01-04 (3) 04-06 (4) 06-07 (2) 07-08 (1) 23-01 (1)* 01-05 (2)* 05-06 (3)* 06-07 (1)*
Australasia	09-11 (1) 15-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-21 (1) 15-18 (1)**	09-11 (2) 14-15 (1) 15-17 (2) 17-19 (1) 19-20 (2) 20-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	07-09 (4) 09-10 (3) 10-13 (2) 13-19 (1) 19-22 (2) 22-00 (3) 00-03 (4) 03-05 (3) 05-07 (2)	02-04 (1) 04-05 (2) 05-07 (3) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07)1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (3) 15-17 (4) 17-18 (2) 18-19 (1) 11-16 (1)**	07-08 (1) 08-09 (2) 09-12 (4) 12-14 (3) 14-20 (4) 20-22 (3) 22-23 (2) 23-01 (1)	07-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-01 (4) 01-03 (3) 03-05 (2) 05-07 (3)	19-20 (1) 20-21 (2) 21-23 (3) 23-02 (4) 02-05 (3) 05-06 (2) 06-07 (1) 20-22 (1)* 22-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile Argentina & Urguay	07-08 (1) 08-13 (2) 13-15 (3) 15-18 (4) 18-19)2) 19-20 (1) 11-16 (1)**	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-21)4) 21-23 (3) 23-00 (2) 00-01 (1)	10-15 (1) 15-17 (2) 17-18 (3) 18-01 (4) 01-03 (3) 03-06 (2) 06-08 (3) 08-10 (2)	19-20 (1) 20-21 (2) 21-02 (3) 02-03 (2) 03-05 (1) 20-22 (1)* 22-02 (2)* 02-03 (1)*
McMurdo Sound, Antarctica	11-15 (1) 15-18 (2) 18-19 (1)	10-15 (1) 15-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	16-18 (1) 18-20 (2) 20-02 (3) 02-04 (2) 04-07 (1) 07-09 (2) 09-10 (1)	00-04 (1) 04-06 (2) 06-07 (1)

Time Zone: PDT
(24-Hour Time)
WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	11-13 (1)	08-09 (1) 09-12 (2) 12-14 (1) 14-15 (2) 15-16 (1) 22-00 (1)	00-07 (1) 07-09 (2) 09-13)1) 13-15 (2) 15-19 (3) 19-22 (2) 22-00 (3)	19-21 (1) 21-23 (2) 23-00 (1) 22-23 (1)*
Central & Northern Europe & European USSR	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-16 (1) 22-00 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-23 (2) 23-01 (1) 06-08 (2) 08-09 (1)	19-23 (1)
Eastern Mediter-ranean & Middle East	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (1) 22-00 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-23 (2) 23-01 (1) 06-08 (1)	20-22 (1)
Western & Central Africa	10-13 (1) 13-16 (2) 16-17 (1)	08-11 (1) 11-13 (2) 13-17 (3) 17-19 (2) 19-20 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-03 (2) 03-08 (1)	21-23 (1)

Eastern Africa	13-16 (1)	09-13 (1) 13-15 (2) 16-17 (3) 17-18 (2) 18-19 (1) 00-02 (1)	13-16 (1) 16-18 (2) 18-21 (3) 21-23 (2) 23-00 (1)	*Nil*
Southern Africa	09-11 (1) 11-13 (2) 13-15 (1)	08-10)1) 10-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-18 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (2) 22-00 (3) 00-02 (2) 02-06 (1) 06-08 (2) 08-10 (1)	19-21 (1) 21-22 (2) 22-23 (1) 21-22 (1)*
Central & South Asia	17-19 (1)	08-09 (1) 09-11 (2) 11-13 (1) 16-18 (1) 18-21 (2) 21-23 (1)	06-07 (1) 07-09 (3) 09-11 (1) 19-21 (1) 21-23 (2) 23-01 (1)	05-07 (1) 17-19 (1)
Southeast Asia	16-19 (1)	09-10 (1) 10-12 (3) 12-13 (2) 13-16 (1) 16-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	23-01 (1) 01-02 (2) 02-04 (3) 04-07 (2) 07-09 (3) 09-11 (2) 11-14 (1)	03-07 (1)
Far East	12-14 (1) 14-16 (2) 16-18 (1) 14-16 (1)**	09-10 (1) 10-12 (2) 12-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-22 (2) 22-23 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-04 (4) 04-05 (2) 05-06 (1) 06-08 (2) 08-10 (3) 10-12 (2) 12-14 (1)	01-02 (1) 02-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 03-06 (1)*
South Pacific & New Zealand	10-13 (1) 13-15 (2) 15-18 (3) 18-20 (4) 20-21 (2) 21-22 (1) 12-18 (1)**	08-10 (1) 10-12 (3) 12-15 (2) 15-18 (3) 18-22 (4) 22-00 (3) 00-02 (2) 02-03 (1)	07-09 (4) 09-11 (3) 11-13 (2) 13-17 (1) 17-19 (2) 19-21 (3) 21-03 (4) 03-05 (3) 05-07 (2)	22-23 (1) 23-00 (2) 00-03 (3) 03-06 (4) 06-07 (3) 07-08 (1) 23-01 (1)* 01-06 (2)* 06-07 (1)*
Australasia	13-15 (1) 15-18 (2) 18-20 (3) 20-21 (2) 21-22 (1) 14-18 (1)**	07-08 (1) 08-10 (2) 10-17 (1) 17-19 (2) 19-21 (3) 21-23 (4) 23-00 (3) 00-03 (1)	12-20 (1) 20-22 (2) 22-23 (3) 23-04 (4) 04-06 (3) 06-08 (2) 08-10 (3) 10-12 (2)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-03 (1)* 03-05 (2)* 05-06 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1) 11-14 (1)**	07-08 (1) 08-09 (2) 09-14 (3) 14-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	06-08 (4) 08-11 (3) 11-15 (2) 15-18 (3) 18-04 (4) 04-06 (3)	19-21 (1) 21-01 (3) 01-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 20-22 (1)* 22-04 (2)* 04-05 (1)*
Peru, Bolivia, Paraguay,, Brazil, Chile, Argentina & Uruguay	09-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 11-15 (1)**	06-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-22 (4) 22-23 (3) 23-00 (2) 00-01 (1)	09-15 (1) 15-17 (2) 17-18 (3) 18-01 (4) 01-02 (3) 02-06 (2) 06-08 (3) 08-09 (2)	20-21 (1) 21-00 (2) 00-02 (1) 02-04 (3) 04-05 (2) 05-06 (1) 22-01 (1)* 01-03 (2)* 03-05 (1)*
McMurdo Sound, Antarctica	13-15 (1) 15-17 (2) 17-19 (1)	12-16 (1) 16-18)2) 18-20 (3) 20-22 (2) 22-00 (1)	09-11 (1) 17-19 (1) 19-20 (2) 20-01 (3) 01-03 (2) 03-04 (1) 06-08 (2)	22-23 (1) 23-01 (2) 01-04 (1) 04-06 (2) 06-07 (1)

* Indicates best times to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a propagation index of (2), or higher.

** Indicates best times to listen for F-2 layer openings on 6 Meters.

V.H.F. Ionospheric Openings

The *Perseids* meteor shower is expected to occur in August. This is a major meteor shower which should produce sufficient ionization for v.h.f. meteor-scatter-type openings. The shower should start by August 8th, peak around the 10th, and continue through the 13th.

Seasonally increasing daytime usable frequencies, particularly during late August and September, along with continuing high levels of solar activity, should make possible *F2*-layer DX openings on 6 meters. The best times for such openings are shown in the DX Propagation Charts.

Don't expect 6 meter DX openings every day, but chances are still good for some openings during the daylight hours, particularly when conditions are High Normal or better.

Although a seasonal decrease in sporadic-*E* propagation is expected during August, occasional 6 meter short-skip openings between approximately *1000* and *1300* miles may still be possible. When sporadic-*E* ionization is intense and widespread, similar openings may also be possible on 2 meters. While sporadic-*E* ionization can occur at any time, there is a tendency for it to peak between 8 a.m. and noon, and again between 6 and 9 p.m. local daylight time.

Conditions are improving for trans-equatorial, or TE, openings on 6 meters. An occasional opening may be possible during August, but at best, conditions will be noisy, with signals weak and subject to severe flutter fading. Openings will favor paths between the southern tier states and deep South America. The best time to check for TE openings is during the early evening hours, shortly before and just after sundown, although they may occur at later times as well.

V.h.f. signals can be propagated for distances up to 1000 miles by reflection from ionized patches produced by auroral activity. Auroral displays are most likely to occur during August when conditions are Below Normal or Disturbed on the h.f. bands. Check the Last Minute Forecast appearing at the beginning of this column for those days in August that are expected to be in these categories.

Shortwave Propagation Handbook

The revised 2nd edition of the popular *Shortwave Propagation Handbook,* by George Jacobs, W3ASK, and Theodore J. Cohen, N4XX, is hot off the press. The new edition, containing up-to-date sunspot and solar data, additional prediction charts, and an index, is now available. The book is a definitive work on the fascinating subject of shortwave propagation. It is written in simple, understandable language and is intended to be *read and used* by radio amateurs, shortwave listeners, and all others who make use of the shortwave radio spectrum. The book stresses well-tested do-it-yourself forecasting, and literally contains propagation "road maps" to world-wide shortwave propagation conditions, which eliminates much of the mystery and complexity usually encountered in making such determinations.

Contents of the book include principles of ionospheric propagation; sunspots and the sunspot cycle; sunspot cycle predictions; do-it-yourself propagation predictions and master propagation charts; day-to-day ionospheric forecasting; unusual h.f. and v.h.f. ionospheric propagation. The book is available from CQ's Book Shop.

73, George, W3ASK

a monthly feature by
A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

Here is the Story of The Month for August as told by Keith:

Keith I. Wiese, WA3UQR
All Counties #319, 4-6-81

"I was born in Meadow Grove, Nebraska (population 400) in 1916, the last of 10 children. We all graduated from high school there. Twenty-four years later I received my BBA degree while still in the USAF. No hint of electronics in my life (almost) . . . .

"It was the influence (pressure) from my son, John, to visit a local radio club with him that got the ham bug stirred up in 1973. I was retired from the USAF and working for my home county government—again no inkling that counties would play such an important role in my full retirement. Father and son were licensed (Novice) together, but John quickly beat his OM to 13 w.p.m. c.w. and was on the h.f. voice bands months ahead.

"Then the OM discovered county hunting! The family radio shack was never quite the same thereafter. County hunting is a ham experience like no other, and it must be experienced to be appreciated. It welcomes beginners and rigs of any size. A friendly, efficient net made it possible for a quasi-QRPer like me (100 watts to a vertical) to work 'em all—from one room in the basement.

"My military service began as an Army private ($21 per month) in 1938 and ended in retirement here in the Washington, D.C., area in 1965. I was first an aerial photographer in the Air Corps, then a paymaster in the finance department, and in later years a data processor (programmer). No electronics experience was involved, except for a very brief course in basic electricity at the Air Corps Technical School in 1939. Programming an IBM 1401 computer (1960) required absolutely no electronics knowledge.

"Looking back, however, there certainly were incidents that could (should) have pointed my interest to radio much earlier. (1) My Dad owned the very first radio in town which he used for getting market reports direct from Omaha. (2) As a preteenager (1920s) a neighbor constructed a crystal set, and I was thrilled beyond description when he allowed me to listen to my first radio broadcast. (3) A few years later I spoke on radio station WJAG (Norfolk, Nebraska) to tell folks at home (20 miles away) that our 8th grade class had arrived okay in the big city. (4) When I was a teenager, my nephew became a ham (now K6QM), and again I was thrilled to visit his radio shack (bedroom) with QSLs on the walls and ceilings. (5) My Dad's elevator was, of course, near the railroad station, where on occasion I saw the depot agent exercise his telegraphy skills—a wonder to me. (6) My first on-the-air ham experience came in 1957 when I talked from Hawaii to San Diego via ham phone patch. On that occasion I was able to inform my stateside family that we were "expecting." The child is now WA3UQS.

"Awards to date are few, but important. In addition to a number of the "wall paper" awards on 10 meters, I was quite excited about getting WAS Bicentennial #1792. After becoming a county hunter, that was it. Now that the prestigious All Counties Award is completed, I am in a state of shock, rediscovering family, friends, yard and garden work, etc. However, my conclusion remains that it is difficult to imagine any hobby better than ham radio, and more than that a hobby-within-a-hobby: County Hunting!"

Keith Wiese, WA3UQR. Eureka, that last county found!

Left to right: WA3ZBK, WA3OID, W3HEK, and WA3UQR auditing the WA3UQR application, 4-3-81.

P.O. Box 73, Rochelle Park, NJ 07662

Special Honor Roll
All Counties

#370 Norman M. Talley, Jr., W4ARH 4-8-82.
#371 H.L. Williams, Jr., N7AKG 4-12-82.
#372 Ace Burdett, N9CHU 4-14-82.
#373 Dr. Roger C. Fitch, K7GTK 4-16-82.
#374 Robert B. Donaldson, WØGOR 4-14-82.
#375 David H. Vig, N7BKW 4-19-82.
#376 Richard W. Roberts, K9BX 4-27-82.
#377 Van N. Peterson, K4QFK 5-3-82.
#378 Donald J. Conrad, N4CCJ 5-6-82.
#379 W. Stanley Lamb, W1WHQ 5-7-82.

Awards Issued

Norman Talley, W4ARH, waited until he had them All and sent for USA-CA-500 through All Counties endorsed All 14, All S.S.B., All Mobiles.

Hugh Williams, N7AKG, added to his collection USA-CA-2500, 3000, and All Counties endorsed All S.S.B., All 14.

Ace Burdett, N9CHU, added All Counties endorsed Mixed to his fine collection.

Dr. Roger Fitch, K7GTK/KL7HSX, who was issued USA-CA-500 in September 1962, became active and got his paperwork finished to claim USA-CA-1000 through All Counties endorsed Mixed.

Don Donaldson, WØGOR, also waited until he had them All and received USA-CA-500 through USA-CA-3000 endorsed All S.S.B., All 14, All Mobiles, and All Counties endorsed All S.S.B.

Dave Vig, N7BKW, another one to wait until he had them All, got USA-CA-500 through All Counties endorsed All S.S.B., All 14, All Mobiles.

Doc Roberts, K9BX (ex-K9HFR), waited until he had them All to get USA-CA-500 through All Counties endorsed All S.S.B., All Mobiles.

Van Peterson, K4QFK, another to wait until he had them All, requested USA-CA-500 through USA-CA-3000 endorsed All S.S.B., All 14, and All Counties endorsed Mixed.

USA-CA Honor Roll

3000		2500		2000		1500		1000		500	
W4ARH	399	W4ARH	457	W4ARH	510	W4ARH	576	W4ARH	706	W4ARH	1706
N7AKG	400	N7AKG	458	K7GTK	511	K7GTK	577	WD6CKT	707	WD6CKT	1707
K7GTK	401	K7GTK	459	WØGOR	512	WØGOR	578	K7GTK	708	SM6DUA	1708
WØGOR	402	WØGOR	460	N7BKW	513	N7BKW	579	WØGOR	709	WØGOR	1709
N7BKW	403	N7BKW	461	SMØCHA	514	K9BX	580	N7BKW	710	N7BKW	1710
W1JR	404	AI9Y	462	AI9Y	515	K4QFK	581	K9BX	711	GI6YM	1711
K9BX	405	K9BX	463	K9BX	516	W1WHQ	582	KB7NZ	712	N2DFC	1712
K4KFQ	406	K4QFK	464	K4QFK	517			W4QFK	713	JA8DNZ	1713
W1WHQ	407	W1WHQ	465	W1WHQ	518			W1WHQ	714	K9BX	1714
										AF7T	1715
										KB7NZ	1716
										KN9G	1717
										DLØLC	1718
										K4QFK	1719

Don Conrad, N4CCJ, worked hard to collect All Counties endorsed Mixed to add to his fine collection.

Stanley Lamb, W1WHQ, who received USA-CA-500 in September 1964, sent in his application for USA-CA-1000 through All Counties endorsed Mixed.

Joe Reisert, W1JR, was issued USA-CA-3000 endorsed Mixed.

Mark Stidam, AI9Y (ex-WD9FPQ), gained USA-CA-2000 and 2500 endorsed Mixed.

Charlie Jacobsson, SMØCHA, picked up USA-CA-2000 endorsed All S.S.B. (#2 to Sweden; 40 awards have gone to Sweden).

Gary Proder, WD6CKT, was issued USA-CA-500 and 1000 endorsed Mixed.

Bob Skinner, KB7NZ, acquired USA-CA-500 and 1000 endorsed Mixed.

USA-CA-500 certificate, endorsed All C.W., went to Karl-Gustav Bylehed, SM6DUA.

USA-CA-500 certificates, endorsed Mixed, were sent to:

City of Belfast YMCA Radio Club, GI6YM (#3 award to GI).

Robert E. Furman, N2DFC (ex-WN2BSE, WA2BSE).

Hiroyuki Ogawa, JA8DNZ (#3 to JA8; 40 awards have gone to Japan).

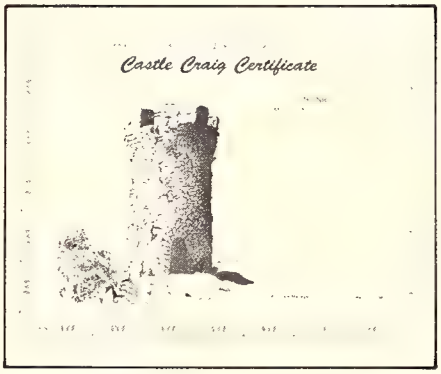
Dr. Hugo Jakobljevich, DLØLC.

USA-CA-500 certificates, endorsed All S.S.B., were requested by:

Carle A. Forster, AF7T (ex-KN2QGN, WB7WHR).

John Kozlowski, KN9G.

Awards



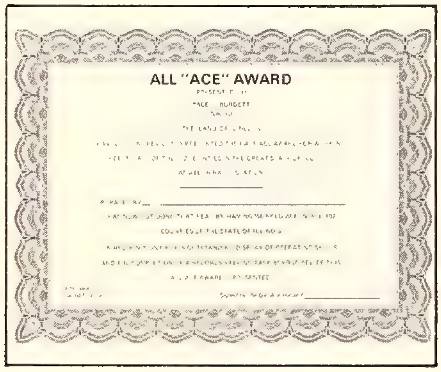
Castle Craig Certificate.

Castle Craig Certificate: The Meriden Amateur Radio Club, established 1946, is proud to found this award in honor of the many historic radio achievements that have taken place in the area surrounding Castle Craig. In the late 1930s, Major Edwin H. Armstrong, working with Professor Daniel E. Noble, designed two experimental 43 MHz f.m. broadcast stations, one used at this site.

Like all 10-10 certificates, 8 points are needed, and they can be obtained by working other 10-10 members, etc. Cost of the certificate is $2.00 for U.S. applicants and $3.00 (or 12 IRCs) for DX applicants. Apply to: Al Kaiser, N1API, 194 Glen Hills Road, Meriden, Connecticut 06450 with log data.

Half "Ace" Award.

Half "Ace" Award: Issued, no cost, for working Ace, N9CHU (ex-KA9AHH), in any 51 of the 102 Illinois counties.



All "Ace" Award.

All "Ace" Award: Issued for working Ace, N9CHU, in all 102 Illinois counties. No cost, no QSLs, no MRCs, etc. Just send list of counties and date worked to: Ace Burdett, N9CHU, 413 Sunnybrook Lane, Wheaton, Illinois 60187.

Sharp Amateur Radio Club Award: This award is available to any amateur in the world (no s.w.l.'s). Contact 50 stations each month for 12 consecutive months, making at least 600 contacts with different stations under these rules:

1. No repeater QSOs will count; satellite QSOs are okay.
2. No duplicate contacts of the same station will be counted, regardless of the band used.
3. Three different bands must be used, totalling 600 QSOs.

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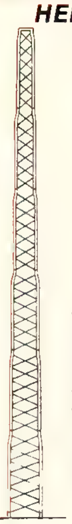

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HBX40	40 ft	10 sq ft	164	BXB6	269	24	293
HBX48	48 ft	10 sq ft	303	BXB7	349	26	375
HBX56	56 ft	10 sq ft	385	BXB8	419	30	449
HDBX40	40 ft	18 sq ft	281	BXB7	313	26	339
HDBX48	48 ft	18 sq ft	363	BXB8	399	30	429

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A744	40 mtr. Add-on Kit for A4 Antenna	$ 69
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20-4CD	4-El. 20 mtr. Beam	$239
15-3CD	3-El. 15 mtr. Beam	$ 99
15-4CD	4-El. 15 mtr. Beam	$109
10-3CD	3-El. 10 mtr. Beam	$ 76
10-4CD	4-El. 10 mtr. Beam	$ 89
A50-5	5-El. 6 mtr. Beam	$ 65
424B	24-El. 432 MHz "Boomer"	$ 63
214B	14-El. 2 mtr. "Boomer"	$ 69
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G6-144B	2 mtr. Base Vertical	$ 69
G7-144	2 mtr. Base Vertical	$ 99

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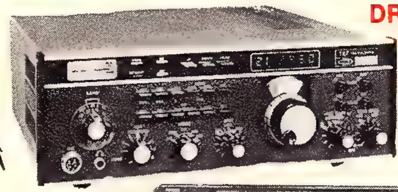
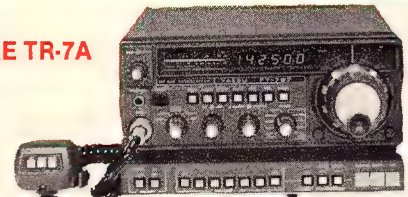
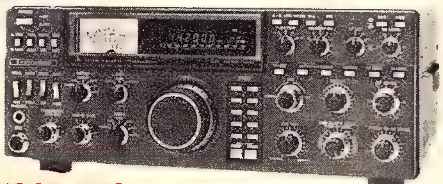


DRAKE TR-7A



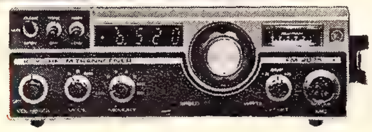
YAESU FT-707

ICOM IC-720A



TRIO-KENWOOD 930S

KDK FM-2025



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SL-8010	80.40.20. 15.10	75'	$59.95
SL-160	160	130'	$38.95
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FULL SIZE PARALLEL DIPOLES

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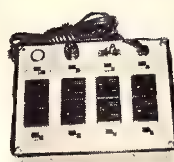

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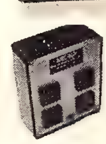

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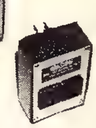

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CIRCLE 92 ON READER SERVICE CARD

Sharp Amateur Radio Club Award.

4. The contacts must include either 1 member station of the Sharp ARC *or* 5 YL stations.
5. All contest QSOs are valid.
6. Domestic rules for applications within Japan are different.
7. Send copy of log only (certified by at least two other radio amateurs). While exchange of QSL cards at the time of application is not mandatory, the applicant must issue a document certifying that he/she has issued *all* QSLs for the valid contacts for this award. Please enclose 8 IRCs or 500 Japanese Yen, and your address label. Apply to: T. Nishikawa, JF3MXU, 5-7 Motoyama-Kitamachi 4-chome, Higashinada-Ku, Kobe-City, Kobe 658 Japan. For a list of Sharp ARC members, send 2 IRCs and your address label.

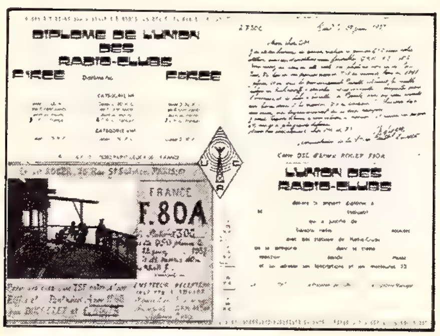
Diplome de L'Union des Radio Clubs (URCA Award): This award is issued to all amateur radio stations (or s.w.l.'s) who can demonstrate having two-way contacts (or heard) with the maximum number of radio club stations around the world. There are three classes:

Class 1: 100 different radio clubs with at least 30 French radio clubs + any 70 radio clubs in the 6 continents.

Class 2: 80 different radio clubs with at least 20 French radio clubs + any 60 radio clubs in 5 continents.

Class 3: 50 different radio clubs with at least 10 French radio clubs + any 40 radio clubs in 4 continents.

All QSOs after 1 January 1968 are valid. All modes and bands are permitted. Do not send QSL cards. A list showing full details (log information) certified by one radio club officer should be sent with $4.00 U.S. or 12 IRCs to URC, Awards Manager, F6FNA, P.O. Box 73, 75362 Paris CXO 8, France. (All first suffix K's in French calls denote radio clubs—ex., F6KMX, F6KAW, etc.)



URCA Award. Note: Military clubs in RFA (FFA) are valid for French Radio Clubs.

Diplome de La Region Parisienne (DRP Award): This award is issued to all amateur radio stations (or s.w.l.'s) who can demonstrate two-way contacts (or heard) with Region Parisienne stations.

The Region Parisienne departments are 77, 78, 91, 92, 93, 94, and 95. The department number is on the French QSL card. These are the two first numbers of the postal code (ex., 77645 = 77, 91800 = 91, 95645 = 95, etc.).

There are three classes:

Class 1: QSO with 5 stations in each 7 departments—total 35.

Class 2: QSO with 3 stations in each 7 departments—total 21.

Class 3: QSO with 1 station in each 7 departments—total 7.

All QSOs after 1 January 1970 are valid. Send certified list with 8 IRCs to: DRP Awards Manager, FE6377, Georges Houy, 16 Rue A. Bossu, Drancy, France.

The VK5 Whiskey Charlie Award: This award was originally created to commemorate 25 years of the club's existence and is still an award-hunter's challenge.

For the first 23½ years of VK5WC's existence, it was the only call sign authorized from Woomera, now a small Australian community and the former home of the European Launch Developement Organization (ELDO). Active calls operating from the village include VK5OL, VK5MQ, VK5AH, VK5LA, and the club station, VK5WC.

The VK5WC certificate.

The award is available to all licensed amateurs throughout the world who can show proof of two-way contacts with the club station, VK5WC, and two club members, or four different Woomera stations who are club members. Contacts from 3 May 1978 on are valid.

Send copy of all log data signed by the applicant and certified by two other amateur radio operators. Apply to: Awards Manager, Woomera Amateur Radio Club, P.O. Box 538, Woomera, South Australia 5720. Send $2.50 in Australian currency or the equivalent. *(Thanks, Tony, K8CIW, for this data.)*

Notes

If you were fortunate enough to work the special event station W8WVA between July 16 and July 18 during the Port Huron to Mackinac Yacht Race, send a self-addressed business-size (or larger) envelope for their certificate (oh yes, put 38¢ postage on the envelope; DX 2 IRCs) to: Andy Pitt, WB8WEZ, Box 484, Welch, West Virginia 24801.

Port Huron to Mackinac Island Award.

Remember, all *CQ* Awards now cost non-subscribers $10.00. Subscribers pay $4.00 and must include the mailing label (or copy) from a recent issue of *CQ*. Calls *not* accepted for USA-CA include WB2HTX (now KC2MO), WB5WOE, WB6CKU, W6NV, KL7NV, WB9TKE, and W9HAT.

73, Ed, W2GT

a monthly feature by
HUGH CASSIDY, WA6AUD

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

Forsake not an old DXer,
For the new is not comparable to him.
A new Dxer is as new wine;
When he is old,
Thou shall greet him with pleasure. . . .

To some it is a surprise to find that DXing is a movable feast. Sometimes fretting comes not because of countries worked or countries missed, but because of deeper things. These matters, often unspoken and mostly unanswered, will test the patience of even the most enduring. Last week one of the Locals was up the hill to again ask one of the Eternal Questions of DXing. "When will I be considered an Old Timer?" he asked. It was a question asked in other years, a question that does not fade away, and a question that probably will always be with us.

We did not try to answer the question straight out. The feeling was that the Local asked one question to conceal another. "What is the problem?" we asked. Then we started to know what was bothering the Local DX type.

It was not a new problem. This one had come late to DXing after years of activity in other amateur fields. He held an Extra Class license, a 1X2 W callsign, and definitely was technically proficient. He had worked a respectable total of DX country counters, and although there was no way he could catch those countries which had gone before him, he had missed nothing that had come since.

"I've been in the club three years now," he told us. "I've been at all the meetings and have tried to be active in club activities. Last year I won a trophy in one of the DX contests. I really like DXing now that I've gotten into it, but I get the feeling, and sometimes I even catch an offhand remark, that seems to indicate that many in the DX club still consider me a recruit. What does one have to do to change things? When is it that one becomes considered an Old Timer?"

We had suspected that this would not be an easy one to handle, and it was not. It was obvious that he was feeling some slight, and we wished for a quick solution to his problem. In all frankness we did not think that there would be any. But we could still understand him. As was once

77 Coleman Dr., San Rafael, CA 94901

You've probably heard Rubin Hughes, WA6AHF, on the air, or perhaps over the years worked him at a DX spot in the Caribbean or the Pacific. He was last out on the No. Calif. DX Club trip to Niue last fall. (CQ staff photo)

said a long time ago, "You're young so short a time; you're old so long." While there are both joy and worry in being young, and often a strong belief that the golden days will last forever, one soon finds that they are gone but long remembered. Eventually, one learns the joys that the old DXers know—things hardly ever spoken of, but always there, the memories that come like faint music from a farther room. It is because of happenings shared.

But how does one explain such things to one who may not be ready to understand? We had to try. "All of the feelings you have of not yet being accepted may have come from those other DXers having traveled the same roads together in other times," we said. "Experiences that they have known and shared bind one to the other, and all of us know the small joys of recalling the good old days. Even if they are not mentioned, they are still known. Add this to the fact that on joining a club one tends to revere and honor all those who were there before, and question and avoid those who come after. Understand all of this, and you'll be close to understanding how things work. Right?" We were thinking that we had done a pretty good job of laying out things and heading the Local in the right direction, but there was a blank look on his face. We wondered if we had missed.

"Look," he said, "all I asked was what one has to do to be an Old Timer in the club. Long before I ever got interested in DXing, I heard about the DX Mystique. But I don't understand it, and I don't understand what you are driving at. Isn't it possible to explain it in simple terms?"

We thought we had. However, it was obvious that we had to try again. "Look at it this way," we said. "The things that most others have in common is having been there when something happened. They worried about and tried to work places like Spratly, Kingman, Abu Ail, Mt. Athos, Annobon, and a handful of others when they came on the air for the first time. In many ways they shared a common experience and the joy of working a new one on the air for the first time. That experience will always live with them. Certainly you can understand how that is, can't you?" He did not.

"I hear what you say," he said, "but nothing seems to fit together. I can understand what you say about the club members, but it does seem that at some place and at some time there should be a measure of general acceptance that you do exist and that you are around to stay. That is something that I think I have not found." At this point we were beginning to realize that maybe we had better try something else. And while we live with the bright hope and the unshaken belief in the nobility of DXers, we were starting to wonder if this one was ready to understand even the most elementary of the Eternal Mysteries. We decided to change direction. We went simplistic.

"Perhaps you will understand it this way," we said, starting afresh. "You will be considered an Old Timer when it has been so long since you called 'CQ DX, CQ DX' that you cannot remember ever having done it. And when that day is at hand, you'll really be considered an Old Timer and a true-blue DXer. Do you understand that?"

He did! There were smiles everywhere and we started to relax. "That sounds right," the Local said, "and I don't think I've been calling 'CQ DX' much of late, probably not for a week or so. Seems that it seldom does much good, and a couple of times recently someone broke in to tell me that I was right on top of a DX station already there which I hadn't heard." The smile faded just a bit, and we suspected another question was coming.

"But how will I know that I'm a real Old Timer?" he asked. "Will someone tell me or will I get a certificate or something?"

What could we say? When that day comes, one always knows it. That day will be the day when you stop worrying whether or not other DXers truly appreciate

The WPX Program

Mixed

986 .... K4RDU

S.S.B.

1495	WA1YIO	1499	DJ7OB
1496	N5CSW	1500	DJ5VQ
1497	W6PGK	1501	DL3LT
1498	I2YKV		

C. W.

2146	DF8KR	2149	PY1WDS
2147	OK3TAY	2150	K6UXO
2148	WA8AXU		

WPNX

208	N5EBD	209	WB1DSS

Endorsements

Mixed: 450 YU3VM, 500 YU3VM, KE5J. 550 YU3VM. 600 YU3VM, N2AIF. 650 YU3VM, N2AIF, VE2FOU. 700 WD9IIC, YU3VM, K7CU. 800 W6YMH. 850 KC8CC. 900 KC8CC, K2OLG. 950 LA7JO. 1050 KL7AF. 1300 IN3ANE. 1600 N2AC. 1850 N4MM.

S.S.B.: 350 KE5J, DJ7OB, DJ5VQ, DL3LT, VE2FOU. 400 DJ5VQ, DL3LT. 450 DJ5VQ, DL3LT. 500 YU5XAF, K7CU, DJ5VQ. 550 DJ5VQ, W6YMH. 600 JH4PRU, DJ5VQ. 650 OE8MOK, DJ5VQ, WA2SRM. 750 K9UQN. 800 ZL1AGO, WB6GFJ. 850 KC8CC, KL7AF. 1600 ZL3NS, N4MM.

C.W.: 400 JE2GAL. 450 N2AIF, ZL2AWW. 500 OK3FON, PAØLUS, N2AIF. 550 N2AIF, DJ4VP, KJ7N. 600 DJ4VP. 750 IØPSB. 850 I2DMK. 1050 K4RDU. 1300 N4MM.

VPX: OE1-109976-551.

Award of Excellence 160 meter endorsement: K6JG.

10 meters:	OE1KJW, W9DWQ, N4YB, IN3ANE, PAØLUS, UB5-0683.
15 meters:	WA8AXU, W9DWQ.
20 meters:	YU5XAF, CK3TAY, AG5C, W9DWQ.
40 meters:	WA4OIB, JH7FFN/1, W8DWQ.
80 meters:	K7CU, W9DWQ.

Asia:	IN3VZE, KE5J, W9DWQ.
Africa:	K2VV.
Europe:	OK3TAY, W3ARK.
No. America:	W8DWQ, JH5FQO, W3ARK, ZL2AWW, OE8MOK, IN3VZE, KB2ZQ, KE5J.
So. America:	W9DWQ.
Oceania:	W9DWQ.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

your sterling qualities. We almost started to express this thought to the Local, but caution stopped us short of any utterances. There are always those Eternal Enigmas known only to the Deserving, and to bring up another abstract DX concept might be to revive confusion.

But never forget! When that day comes you'll know it. Those who arrive at that day always do!

Heard Island

The long-awaited Heard Island effort is currently scheduled for right after the turn of the year. As of mid-summer, most of the $30,000 budget had been raised, and the extended operating effort did seem to be on the way. There are a number of organizations sponsoring this effort, with the Wireless Institute of Australia doing the on-scene preparations. Also supporting the Heard effort are the Northern California DX Foundation, the International DX Foundation, and a growing list of individual contributors.

The last extended operation from Heard was back in 1969–70, when a U.S. team was on the island for about six months. The report was that they were there for celestial observations. Hugh Milburn, WA6EAM, signed VKØHM and AXØHM during the extended stay. That operation dried up a lot of the demand for Heard Island. The only other recent action there was a brief bit of activity a couple of years back when a U.S. Coast Guard vessel stopped there for about three days, and Bill Rohrer put a station on the air. Don Miller was also reported as having been there, but along the way that operation was thrown out by the ARRL. That was a long time ago.

The upcoming effort will be all bands, 160 through 10 meters. It is reported that some mountaineers will also accompany the effort, these aiming for an ascent of Big Ben, the ice-covered mountain which dominates the scenery of Heard Island.

Years back, the Australian government maintained a cable station on Heard Island, but it was abandoned a good many years back when other communication modes made the cable station obsolete. Back when VKØHM was on the island, the buildings of the cable station were still standing, as were some antenna towers. The island is only occasionally visited these days.

Though the up-coming effort is planned for as long as possibly six weeks, within a couple of years you will see Heard Island again creeping up on the list of needed countries. If you need it, plan ahead. It may be another long spell before it is heard again.

Erik, SMØAGD

After visiting California in late April, Erik headed out to the Pacific and the sailing vessel *Marathon AQ,* which is currently on a two-year circumnavigation of the world. In July the crew was aiming to appear from T30-Western Kiribati, T2-Tuvalu, FW8-Wallis, A35-Tonga, ZL/VK, VK9Z-Mellish, H44-Solomon Islands, C2-Nauru, KC6-Eastern Carolines, and 1S-Spratly. It is not a sure thing that they will show at all of these although they were aiming for them. Nor was it possible that they could keep to the schedule. Listen for their operations for information on their plans and next stops.

After leaving the Pacific Ocean areas and the South China Sea, the plans are to push westward into the Indian Ocean area, operating at many DX spots enroute. QSLs for Erik's operations go to SM3CXS, his long-time QSL Manager. This group should be showing from a good number of choice DX spots in the latter part of this year.

Albania

With this one being almost everyone's unfulfilled dream, any news about possible operations is of interest, and more so if you hunger to clasp that ZA-QSL in your hot hand.

EA2AJH was in Albania during the spring and was allowed to make a handful of demonstration QSOs—something like eight. He did get official approval for this brief operation, working mostly Spanish stations. However, he was given the indication that a license might eventually be approved and that a long-term, big QSO operation would be allowed. Keeping in mind that both "long-term" and "big QSO" are relative terms, it is still possible to find some hope for the future.

Erik Sjolund, SMØAGD, holds the plaque awarded to him on his induction into the CQ DX Hall of Fame. Erik currently is on the world cruise of the sailing vessel Marathon AQ, *and during the summer months was heard from a number of operations in the western Pacific.*

Marty Laine, OH2BH, is also trying to work a wedge into the door and has been trying to line up an amateur station at the University of Tirana. Marty was involved in the brief ZA-operation about 12 years back, coming in openly with gear and operating briefly while under surveillance. At that time it was hoped that some of the barriers might be lifted. Twelve years later Marty is still hoping and working to make ZA available. Some day something will work.

KF1O/CEØX

The ARRL announced back in April that because of a lot of questions, both answered and unanswered, QSL cards for the KF1O/CEØX operation last year would not be accepted. One of the questions was whether or not the operation was even on San Felix.

In the April column the points raised on this operation by the Chilean authorities and Radio Club de Chile were listed. This included the premise that the operation had taken place on the mainland somewhere between Valparaiso and Santiago. Whatever all the facts may be, there's no tomorrow for your KF1O/CEØX QSLs because of a feeling that there really was no yesterday.

Kansas DX Association

Years back, a DX type mentioned in passing that living in a sparsely populated state brought him the feeling of loneliness, as there were few, if any, other DXers in his area. He often wished for another DXer close by with whom he might engage in conversation on a subject of mu-

5 Band WAZ

Standings as of May 1, 1982

All 200 zones worked:

1. ON4UN, John Devoldere (Belgium)
2. K4MQG, Gary Dixon (U.S.A.)
3. SM4CAN, Kent Svensson (Sweden)
4. AA6AA, Steve Orland (U.S.A.)
5. W8AH, Albert Hix (U.S.A.)
6. W6KUT, E. A. Andress (U.S.A.)
7. EA8AK, Fernando Fernande (Spain)
8. LA7JO, Stig Lindblom (Norway)
9. EA3SF, Fernando Blenert (Spain)
10. OH1XX, Hannu Nieminen (Finland)
11. EA8OZ, Julio Rosello (Spain)
12. WØSD, Edward Gray (U.S.A.)
13. KØZZ, Gary Knutson (U.S.A.)
14. ON6OS, P. Michiels (Belgium)
15. OK3TCA, E. Melcer (Czech.)
16. K6SSS, Fred Capossela (U.S.A.)
17. ZL3GQ, Peter W. Watson (New Zealand)
18. OK3CGP, Stefan Melcer (Czech.)
19. SMØAJU, Leif Lundin (Sweden)
20. OZ3PZ, Preben Thomsen (Denmark)
21. I3MAU, Reno Mauri (Italy)
22. I2ZGC, Gianni Zillio (Italy)
23. 4Z4DX, Dov Gavish (Israel)
24. N4KE, Ron Blake (U.S.A.)
25. K5UR, Rick Roderick (U.S.A.)
26. K9AJ, Michael McGirr (U.S.A.)
27. SM3EVR, Tord E. Julander (Sweden)
28. LA5YJ, Bjorn Hugo Ark (Norway)
29. DL3RK, Walter Geyrhalter (W. Germany)
30. N4WJ, Frank McCormick (U.S.A.)
31. G3MCS, W.R. Hawthorne (England)
32. SM5AQD, Hakan "Hawk" Eriksson (Sweden)
33. WØMLY, George McKercher (U.S.A.)
34. IØRIZ, Gianni Rizzi (Italy)
35. ON5NT, Ghislain Penny (Belgium)
36. OH6JW, Antti Kiviuoma (Finland)
37. OK1AWZ, Milan Dlabac (Czech.)

The top 12 contenders for 5 Band WAZ:

1. CT1FL, 198
2. DL6RX, 198
3. EA8QL, 197
4. K1MEN, 197
5. ZL1BIL, 196
6. K4CEB, 194
7. TG9NX, 193
8. N4RR, 192
9. NE7IG, 192
10. LA9GV, 191
11. N6DX, 191
12. F6DZU, 191

152 Stations have attained the 150 zone level

tual interest. This one eventually subscribed to a DX bulletin and said that this did much to ease his feeling of isolation.

At the time, this made an impression on us that we never lost. Dxers, although they are a group with acquaintances all over the world, may wish to find someone close to help them develop the feeling of DX togetherness, fraternalism, or whatever label you want to put on it.

A survey was made about 15 years ago to compile a list of DX clubs around the country. Not too many of them turned up. This was a surprise. There was hardly more than a handful in existence. However, things have changed. DX has advanced, and in many areas one need no longer be lonely.

The Kansas DX Assn. is an example of a DX group that has developed in recent years. They meet monthly, conduct a weekly DX information net on the air, and also use a 2-meter frequency. A monthly 10-page club bulletin is turned out by Dean Lewis, WAØTKJ. Across the country DX clubs are flourishing, and in turn DX flourishes. The Kansas DX Assn. is an example of these recent changes.

One club that existed back in the mid-sixties now has about five times the membership it had then. This is not unusual growth. Your familiar weekly DX bulletins then could be counted on three, maybe four, fingers, with their circulation in the hundreds. Now they count their readership in the thousands.

Why do we mention the Kansas DX Assn.? It typifies the changes that have come and the extent to which DXing has prospered. DX has always been the good life. It is better as DXers get more organized. Come to think of it, here in the states a DXer should hardly ever feel lonely. Maybe a bit disconcerted when you've been trampled in a pile-up, but it took a lot of other DXers to trample you.

Clyde Valley in Scotland

This August the Clyde Valley DX Group will be showing from all points of the compass in Scotland with a special callsign and a special QSL card. Look for them during the weekends this month. South they will be heard from the Mull of Galloway. West they will be at Ardnamurchan Point. Then north to Dunnet Head and east to Buchan Ness, all of these being familiar household localities. The Scottish Tourist Board is assisting in some of the planning of this effort.

Work the Clyde Valley Group at all four places and you qualify for an exclusive certificate. Gordon Hunter, GM3ULP, says that the certificate is the main reason for the around-the-compass effort. They may show at times other than weekends, so as Lord Baden-Powell, Hero of Mafeking, often said, "Be prepared!"

The WAZ Program

10 Meter Phone

195	WB5TXP	198	WD9IIC
196	OH6JW	199	WØMLY
197	VK2DPN		

15 Meter Phone

125	OH6JW	128	OH1FS
126	G4IJW	129	JR1SSR
127	WØMLY		

20 Meter Phone

404	W6NLG	405	OH6JW

80 Meter Phone

18	OH6JW

10 Meter C.W.

35	JA1MDK

15 Meter C.W.

67	N4WJ	69	W2LRU
68	WØMLY		

20 Meter C.W.

164	N5HB	166	N4WJ
165	KF2O	167	WB3JVU

40 Meter C.W.

34	WØMLY

All Band WAZ

S.S.B.

2429	WDØGML	2443	KR8N
2430	OZ2DM	2444	DF5KX
2431	W5RRK	2445	DF6MB
2432	OE2WJL	2446	JJ1IHS
2433	W5ZKJ	2447	K5VYT
2434	I2KKL	2448	SM7ASL
2435	IØEKY	2449	W5LLU
2436	K5HT	2450	CT2CE
2437	WA2DGS	2451	W6DPD
2438	AI9R	2452	I8IGS
2439	WD4BEE	2453	I4RXB
2440	N4AXT	2454	IØPSB
2441	HB9BRC	2455	K4WHN
2442	PAØBDO	2456	F6BDG

C.W. and Phone

5349	HH2VP	5361	DL5NA
5350	WA2NPD	5362	JA2LMY
5351	W7ALZ	5363	PA3BIL
5352	K9TTM	5364	WØYBV
5353	HK3YH	5365	DF5QH
5354	W1WEF	5366	SM6CQV
5355	K5PR	5367	PA3ABB
5356	AI9R	5368	JH8IVO
5357	KG2A	5369	WB8RJX
5358	K8CX	5370	IØKHP
5359	FO8DF	5371	K9VGE
5360	KN5D		

All Phone

579	JA1IEF

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application.

VERON Award and Certificate Guide

VERON stands for Vereniging voor Experimenteel Radio Onderzoek in Nederland, although VERON is heard a lot more often than the full name. VERON has made available the Dutch Award and Certificate Guide in an English translation. Cost inside Europe is $3 U.S., while outside Europe it is $4 U.S. If necessary, yearly updates will be provided. Any excess above costs will go to gear improvements in the club station, PAØRCA. In the Netherlands the national club station, PAØAA, is on each Friday at 2015Z and 2215Z on 3.4 MHz, 14.1 MHz, and 144.8 MHz. If you want further information, drop a line to VERON Amsterdam, POB 9, 1000 AA Amsterdam, Netherlands.

Western Pennsylvania DX Assn.

This DX group was formed in the Pittsburgh area early this spring with Al Houston, N2MA/3, as President. The group is looking for other DXers in the area to join with them in the happy pursuit of the elusive and needed countries, as well as other efforts beneficial to DXers.

The group has put a repeater on 144.77/145.37 MHz. They run a weekly DX information net and will have quarterly newsletters. If you are within calling distance and want to know more, drop a line to Wayne Albert, KB3KV, 1508 Ligonier, Latrobe, PA 15650.

Braille DX Assn.

Some years back, Phil Scovell, AFØH, lost his eyesight because of detached retinas. After a couple of years of blindness, Phil obtained his first license, later advancing to General Class and DXing.

Without sight some of the simple things of DXing can pose problems, and these include obtaining DX information, QSL information, and getting one's own cards out. Eventually the idea of providing needed DX service to blind DXers developed, and thus the Braille DX Service came into existence.

Each month a cassette recording of current DX information, DXpeditions, and QSL information is provided. A current DXCC country list is provided in either braille or on cassette tape. QSL service for outgoing QSLs is provided through volunteers.

A one-time $2.00 registration donation pays for blank cassettes and other braille material. Anyone needing further information, either for himself or for a blind DXer, can write to Phil Scovell, AFØH, 8347 W. Sixth Ave., Lakewood, CO 80215.

Aland Islands

From August 10th to the 19th, a group of British amateurs will be operating from the Aland Islands (OHØ) with a variety of calls. All bands from 160 to 144 MHz will be used with the exception of 10 and 6 meters. Most, but not all, action will be on s.s.b.

Again in on the trip will be Stephen Lowe, G4JVG (who has previously operated from the Alands and SMØ and EP2), G4IWA, and a third G-operator not settled on at this writing. They will use the Drake C-line plus a National NCL-2000 amplifier. Dipoles are planned for the lower frequencies and beams for the h.f. bands. They will be active from the island of Kokar. QSLs will go to the G-bureau or direct for G4JVG/OHØ to D. Crisp, 2 Flaxman Close, Earley, Reading, Berks., England. G4IWA/OHØ can go to J. Arrowsmith, 16 Mancetter Road, Mancetter, Atherstone, Warwicks, CV9 1NZ, England, these with an IRC or something green for the postage problem.

RSGB President

Dr. John Allaway, G3FKM, and the writer of the RSGB's DX Column, "The Month on the Air," for some 16 years since 1966, was elected President of the RSGB for the second time early this year.

Dr. Allaway, a medical professor at the University of Birmingham, has been long active in DX circles as well as many activities for the RSGB. He has traveled extensively outside England on RSGB matters and amateur radio at international levels.

Some Short DX Notes

The enduring question on the 7Z2AP QSLs seems to be just that—enduring. At the California International the word was that while queries to one of the Saudi Arabian princes did bring an oral confirmation that the operation was legitimate, no documentary backing for the operation has been received from the Saudi authorities. Thus, the cards for the 7Z2AP action were not being accepted. For A6XJC a letter was expected at Newington, and the XZ cards from the operations early this year were still not acceptable.

On the G5/5A operation some months back, there was a question of documentation; the 9U5JM cards were okay. In the expansion bands, consideration was being given to not involving awards and contests in their precincts. There was also the suggestion that QSLs for BY1PK might best be sent to VE7BC rather than to the address in downtown Beijing, as that one did not seem to be working at all.

The 8Z4 Neutral Zone was expected to

CQ DX Awards Program

S.S.B.

1120	K1HDO	1129	I6VYV
1121	VE5AE	1130	WD8IDD
1122	K9IW	1131	WB5LBR
1123	N9AMF	1132	K4BXU
1124	AI8M	1133	KB2ZQ
1125	KA3ANG	1134	KB5EK
1126	ACØA	1135	N5AWS
1127	EI5DP	1136	W5LLU
1128	K4KYI		

C.W.

536	OK3YDP	539	JL1LAP
537	K9IW	540	DF2RG
538	VE2DPJ		

S.S.B. Endorsements

310	K6WR/318	275	KØGT/291
310	W3NKM/318	275	KB5FU/284
310	ZL3NS/316	275	N9AMF/281
310	YV1KZ/315	275	AI8M/281
310	ZL1AGO/314	275	ACØA/280
310	F2MO/314	275	KB5RF/277
310	K9RF/313	275	I8INW/277
310	OE2EGL/313	275	JH4PRU/277
310	I3LLD/311	275	NN4Q/275
310	N2SS/310	250	N5AWS/263
300	ZL1BIL/305	250	WA2SRM/250
300	9H4G/303	250	KL7AF/250
300	LA7JO/302	200	K1HDO/211
275	K9IW/296	150	KA3ANG/154
275	AI5I/295	QRPp	WD8IDD
275	WA4DAN/294	28 MHz	KB5EK
275	W9RY/294	28 MHz	N5AWS

C.W. Endorsements

250	K9IW/262	150	KA3R/179
200	NN4Q/232	28 MHz	WD9IIC
150	VE1ACK/156	28 MHz	DF2RG

With the deletion of Kamaran (VS9K), the number of active countries is now 318. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply.

be deleted due to the signing of a treaty resolving the borders there, and Baja Nuevo and Serrana Bank probably will also see some changes due to treaties being signed affecting sovereignty.

Early this year there was some Argentine Radio Club activity in the south Atlantic—and we do not mean that other hassle. Anyhow, some points have been raised on the LU5ZY operation, as it is believed that the operation was north of 60°S. This area is not defined by the 1961 Antarctic Treaty as being international. However, the ARRL does seem to accept the cards.

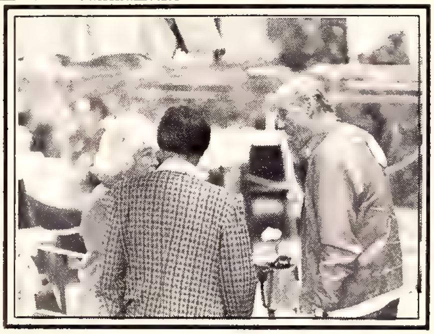
7Q7LW is reported to be the only current amateur in Malawi. This is Les Sampson out of the U.K. WB0MKR/KH3 should be on Johnston Island the rest of the year.

With the proposals to expand the U.S. phone sub-band on 20 meters, *Long Skip* of the Canadian DX Assn. has raised some questions on the proposal. The editor of *Long Skip* felt that expansion would not help 20 meters at all. The amateur population in the U.S. is growing faster than in the rest of the world, and two-thirds of the world's amateurs reside within the U.S. The proposal in the discussion is that there is merit to the extension of sub-bands on population basis if all are to be considered. The idea apparently is that countries with lesser population need quiet areas for their own use, and if 20 meters is expanded, they'll move to other bands.

Relative to the matter is that while WARC treaties designate what the amateur frequencies are, the countries themselves are the ones which decide on sub-bands within the amateur allocations. Phone sub-bands to a large extent have been a U.S. phenomena dating back almost 50 years to the times when the U.S. tried to take the lead to bring some order to band usage.

You probably have already noted the trend towards changes in prefixes with two numbers showing rather than one. Cape Verde is signing D44, Djibouti J28, Gambia C53, Comoro D68, E. Kiribati T32, and similar changes. To keep up with DXing these days one must be eternally vigilant. Rhodesia when it changed to Zimbabwe dropped the "E" from the "ZE" and added "2." Thus, ZE1DL became Z21DL.

The KP2A/KP1 Navassa Island effort, featured in a May issue of *Time* magazine, as all devoted DXers know, ran up 33.5 K QSOs, or an average of 4.3 QSOs per minute, while they were on the island. This IDXF sponsored effort had N2OO, K0OO, W0DX, K1MEM, K8CW, N6CW, W2IJB, WA2MOE, and KP2A in the crew. The IDXF has also contributed an FT101ZD with outboard v.f.o. to the Hong Kong Boy Scouts Radio Club, this in an effort to make an HK-station available to visitors. When everything is set, you should consider prior arrangements when headed that way if you wish to operate. Check with N2OO for all the needed information.



Here are some members of the CQ DX Hall of Fame talking over a few DX matters at the California International DX in April. Iris Colvin, W6QL, makes a point with Don Wallace, W6AM, while Lloyd Colvin, W6KG, with his back to the camera, listens. The Colvins had just returned from another YASME tour, some 56 K QSOs being made in the Caribbean area on this last trip. (CQ staff photo)

Rolf Salme is currently in Sri Lanka signing 4S7MX. Rolf has been DXing these many years from various spots and is currently heard with this new callsign. Rolf says that QSLs should be sent to SM3CXS rather than to his Call Book address. S.a.s.e. or s.a.e./IRC needed.

Some final housekeeping notes. With August at hand the *CQ* World Wide DX Test is only a couple of months off, the phone action coming the last full weekend in October and c.w. the last full weekend in November. That is the way it always is, so there is no burden on DXers having to remember. Just save the last full weekends in those months and you'll be in on the action.

Again, we would like to note that the column is written three months in advance of publication date. For example, this August column was written in May. If you are planning something just let us know three months in advance. It is realized that sometimes plans do not jell that far in advance, but if it is even tentative, let us know.

The article by K4IIF in the May column on DXCC countries has been reproduced in chart form. The chart contains a multitude of valuable information for quick reference. Even if you already know everything about DXing, this might be handy in case you encounter a DX skeptic. It is one thing to know you are right, but it is another to be able to prove it. This wall chart makes every DXer an expert. (The chart is 23″ × 35″, two-color, and is available from *CQ* for $2.95 each.)

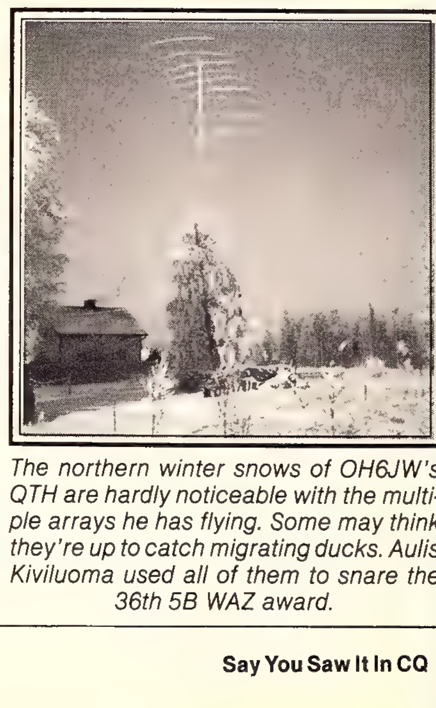
36th 5B WAZ Award

One of these days a DX sage will raise his hands in horror and proclaim that the great days of DXing are over. There never again will be the conditions of the last few years. "Ah! Cycle 21, you were the greatest!" they'll say. But don't you believe it. DX grows and is always better, sometimes more so. And here is Aulis Kiviluoma, OH6JW, to prove it. Not yet 23 years old, he knows the way to work DX and has attained the 5 Band WAZ award.

Aulis works as a soundman on TV station YLE/Channel 2 in Tampere. Starting out as an s.w.l., he got his first Novice license in 1973 and worked up to the top Finnish amateur ticket in 1975. His gear includes a Drake R4B/T4X and an elderly Henry 3K linear. Aulis lives on his parent's farm and has raised a good crop of antennas: 4 elements on 10 at 93 feet, 5 elements on 15 at 75 feet, plus 5 more elements at 45 feet, 6 elements on 20 at 140 feet, and 3 elements on 40 at 115 feet. On 80 he has a vertical ground plane plus a 3-element delta loop aimed at the elusive W6/W7/W0s. Aulis notes that on 80 he has worked a number of 5B WAZ winners, these including AA6AA, W6KUT, W0SD, K0ZZ, and K6SSS coming through on long path. He also works 160 with an inverted Vee.

In 1980 Aulis won the European Trophy in the *CQ* World Wide Contest in the all-band, single-operator category. His

OH6JW, Aulis Kiviluoma, is the 36th winner of 5B WAZ. A sound technician at a TV station, Andy has yet to reach his 23rd birthday, but has been licensed for 9 years. Eighty meters was the final WAZ completed. It took a long time to get just one Zone 2 card.



The northern winter snows of OH6JW's QTH are hardly noticeable with the multiple arrays he has flying. Some may think they're up to catch migrating ducks. Aulis Kiviluoma used all of them to snare the 36th 5B WAZ award.

DXCC total early this spring was 306. He found that WAZ on the higher bands was not difficult, 40 and 80 being the hard ones to crack. A year back, in February 1981, he had 199 cards. It took a full year for him to get the final one—Zone 2 on 80 meters.

OH6JW likes contests and says he'll be right in there. He also is looking for single-band WAZ on 10 to 80 c.w. Having attained probably the most difficult award in amateur radio, Aulis says he is not looking back for the good days of DXing, but is rather looking ahead.

WAZ Mobile On 10 Meters!

Philip Greentree, VK2DPN, in New South Wales is the first ever to work WAZ Mobile on 28 MHz.

Phil started on this 10-meter WAZ in the home driveway there in Hamilton NSW. He was completing a mobile installation in the family car and tested it by working a string of JAs with a converted CB rig putting out 10 watts. That was in February 1980, and he completed the WAZ in September 1981 when he worked JX7FD in zone 40.

After working WAZ Phone/Mobile on 10 meters, what is next? Phil already has All Band WAZ Mobile. On 15 and 20 meters he is waiting for cards from OK1DWA/JTA and from VO2AG to finish off those WAZ Mobile Single Band. Phil already has a WAS Mobile 10 meters, but although the ARRL does not issue a mobile endorsement, the advice to him was that they had no knowledge of a VK working WAS mobile on any band before his showed.

Considering the whole effort, a WAZ Mobile is a monumental achievement. WAZ Mobile 10 meters is even more so. With 15 and 20 meter WAZ Mobile almost at hand, and possibly in hand by the time you read this, the achievement of VK2DPN is most remarkable.

(For the full story, see "The Saga of the Mobile Porcupine" in this issue.)

A22GM to N4FD
C6ADV to N7YL
CN8CY to GW3IEQ
EA2JH/ZA to EA2OP
EF5SSC to EA5BAA
HH2A to AJ9D
HS5AID to AG6N
DA2CK/HB0 to KA2JFY
J3AVT to W8UVZ
J6LZA to K4LTA
KH8AC to WP2ACL
KH6ML to KH6JIM (82 CB)
KR4C/J6 to KR4C
OA4DW to N4DW
P42J to W1BIH
W1BIH/PJ2 to W1BIH
TL8CK to F6EWM
UP0L22 to UA0QFY
VP2VFI to K1IJU
WA2KCL/KP2 to WA2KCL (82 CB)
WD9IHD/HK3 to WD4PTO
YB0PG to KB5AS
ZF2FQ to AB8Y
ZL1AFU to N5TX
ZL2ATU to WB8WMS
ZL3AEO to WB8WMS
ZL0AEO to WB8WMS
ZS1XR to N7RO
Z21DL to KJ0H (U.S. only) (elsewhere—bureau)
3D2AB to WB8WMS
4K1A to UA3AEL
4K1H to UA1CJD
4U1UN (Mar.) to W2MZV
4S7MX to SM3CXS
5B4IJ to OE8PSK
5W1DC to DL3GU
5Z4CV to W2KF
6W8AK to WB4LFM
6W8AR to WB4LFM
9J2JN to WB2IZN
CO2OM to POB 4940, Havana, Cuba
CT2CB to POB 44, Santa Maria, Azores
CJ3ZAY to POB 146, Cambridge, England
GJ4LVH to POB 146, Cambridge, England
G4IWA/OH0 to J. Arrowsmith, 16 Mancetter Rd., Mancetter, Atherstone Warwicks, CV9 1NZ, England
G4JVG/OH0 to D. Crisp, 2 Flaxman Close, Earley, Reading, Berks., England
HL1SF to POB 163, Seoul, Korea
HR1MZM to POB 761, Tegucigalpa, Honduras
PY1BVY to POB 69, Marcia, R.J. 24900 Brazil
5N8OZJ to POB 6589, Lagos, Nigeria
5N0WNL to POB 3197, Lagos, Nigeria
5Z4CM to POB 30514, Nairobi, Kenya

W1BIH advises that although some have indicated that he is the QSL route for P42C, it is just not so. John is the right route for P42J and W1BIH/PJ2, these being used in the WPX test and the ARRL DX weekends. Apparently PJ4C was PJ2PP.

W2YTO is not handling QSLs for VU2RAK or VU2YK. No logs.

73, Cass, WA6AUD

The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. Lifetime Honor Roll fee $2.00, with no fees required for up-dates.

MIXED

2272	YU2DX	1637	N6CW	1238	K5DB	1001	YU3APR	757	AJ6O
2230	F9RM	1584	DJ7CX	1235	KF2O	956	LA7JO	754	KO8T
2038	K6JG	1555	N2AC	1220	K9BG	923	WB8YQX	750	W6YMH
2025	K6XP	1542	N4NO	1205	DL1MD	921	YU2CBK	738	WD9IIC
2016	K2VV	1542	N6JV	1200	W8RSW	901	I2MQP	727	K7CU
1987	W2NC	1504	N9AF	1198	JH1VRQ	893	JA1KRU	722	W6OUL
1954	VE3GCO	1419	W9FD	1180	WA1JMP	879	N4IB	707	W0JIE
1853	N4MM	1415	AA4A/8	1170	SM3EVR	865	WB8ZRL	700	I1ZQD
1762	YU7BCD	1370	I6SF	1149	YU1OBA	865	DA2DC	700	NN4Q
1723	W3PVZ	1368	YU7AW	1145	N6AW	850	KA3A	666	VE2FOU
1718	W7LLC	1325	N6AV	1129	W7CB	826	K2QF	650	KJ7N
1716	W4BQY	1282	W0SFU	1100	K9LJG	820	K7AGJ	630	OE1KJW
1713	N4UU	1269	PA2TMS	1056	N6JM	793	DK2BL	618	JA9FAI
1711	W9DWQ	1262	IN3ANE	1002	KL7AF	765	AI8M	608	K9TI
1651	K5UR	1240	K6ZDL						

S.S.B.

2140	F9RM	1331	I0MBX	1100	WD8MGQ	901	I1MQP	743	PY4OD
1976	I0ZV	1303	W0YDB	1072	DL1MD	885	CT1UA	716	EA3KW
1868	I0AMU	1276	OZ5EV	1060	DJ7CX	883	KC8CC	700	N4IB
1797	K6XP	1262	N4UU	1044	W2CC	880	N2AC	681	W3GXK
1756	K6JG	1250	N2SS	1037	OE2EGL	851	I8KCI	668	DK4AP
1732	K2POA	1234	PA2TMS	1014	N6FX	833	TG9GI	652	KB2DE
1694	K2VV	1201	AA4A/8	1011	KF2O	828	I0RIZ	650	OE8MOK
1646	N4MM	1189	HP1JC	1005	ZP5RS	820	WA2FKF	629	YU3APR
1609	ZL3NS	1170	WA4QMQ	996	JH1VRQ	810	I6NOA	619	VK3NDY
1530	I8KDB	1154	I6ZJC	981	W6YMV	805	KL7AF	611	JH5FQO
1483	I4ZSQ	1134	N4NO	967	W2NC	802	I4LCK	606	VK6YL
1421	YU7BCD	1127	YU7AW	940	KC4OV	750	WB8ZRL	606	W8RSW
1403	K5UR	1121	DJ6VM	902	WA4OIB	750	AC2J	602	W0ULU
1336	W9DWQ	1108	W4BQY	901	G4CHP				

C.W.

1823	W8RSW	1467	DL1QT	1312	W9FD	1069	LZ1XL	800	K8LJG
1764	W2NC	1420	YU7BCD	1293	K5UR	1066	YU7AW	799	JH1VRQ
1703	W8KPL	1415	N4UU	1258	VO1AW	1056	N6FX	735	DL1MD
1599	ON4QX	1376	N2AC	1225	DJ7CX	1000	VE7CNE	731	AA4A/8
1586	WA2HZR	1358	G2GM	1127	W1WLW	965	JE1JKL	701	KL7AF
1528	K6JG	1344	W3ARK	1122	I6SF	930	N4YB	690	DJ1YH
1511	K2VV	1324	N4NO	1108	VK2SS	853	DJ3LR	689	KA3A
1502	N6JV	1317	W4BQY	1077	K6ZDL	827	I1YRL	682	JA5MG
1475	K6XP	1316	N4MM						

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

The Hungarian Contest announcement for July 24–25 was received much too late to be included in last month's issue. However, if you contacted any HA7 stations during that period and have a total of at least 5 since 1970, send your list to the P.R.A.S.Z., P.O. Box 36, H-1387, Budapest, Hungary, along with 6 IRC's for the beautiful "Dunakanyad" diploma.

I only have the dates for the A5 UHF FSTV contest on August 21–22. Never did receive the details. However, you FSTV buffs can get them from Mike Stone, WBØQCD, c/o *A5 ATV Magazine*, P.O. Box H, Lowden, Iowa 52255.

You may have noted that I had two California QSO parties listed in last month's Calendar. That was not an error. At the time there were, in fact, two announced. However, the one dated October 9–10 has been cancelled. The Mission Oaks A.R.A. did not realize that the Northern California C.C. has been running one in October for many years.

Calling your attention to the All Asian C.W. Contest on Aug. 28–29, I recommend that you review the results of last year's contest in this issue. That will give you an idea of what competition you can expect in your area, and you can plan your strategy accordingly. Many awards were picked up with a minimum effort and some areas had no entries.

Complete rules were given in the June issue, along with a list of Asian countries. One thing to keep in mind, however, is that the multiplier for non-Asians is determined by the number of Asian Prefixes worked on each band, not countries (the *CQ* WPX list).

A final reminder: deadline for material for the November issue is August 15th, for the December issue, September 15th.

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

	July	24-25	Hungarian Contest
	Jy-Ag	31-1	Illinois QSO Party
	Aug.	7-8	ARRL UHF Contest
†	Aug.	7-8	Romanian Contest
	Aug.	14-15	European C.W. Contest
*	Aug.	14-15	SEANET Phone Contest
	Aug.	14-15	New Jersey QSO Party
	Aug.	21-22	Alaska QSO Party
	Aug.	21-22	SARTG RTTY Contest
	Aug.	21-22	A5 UHF FSTV Contest
**	Aug.	28-29	All Asian C.W. Contest
	Aug.	28-29	Alabama QSO Party
	Aug.	28-29	Occupation QSO Party
	Sep.	5	Bulgarian C.W. Contest
	Sep.	4-5	Aruba Field Day
	Sep.	4-6	FOUR Land QSO Party
	Sep.	8-10	YLRL "Howdy Days"
	Sep.	11-12	European Phone Contest
	Sep.	11-12	Cray Valley SWL Contest
	Sep.	11-12	G-QRP Activity
	Sep.	11-12	ARRL VHF Contest
	Sep.	19	North America Sprint
	Sep.	18-19	New Mexico QSO Party
	Sep.	18-19	Wash. State QSO Party
	Sep.	18-19	Scandinavian C.W. Contest
	Sep.	25-26	Scandinavian Phone Contest
	Sep.	25-26	Delta QSO Party
	Oct.	2-3	California QSO Party
	Oct.	2-3	VK/ZL/Oceania Phone Contest
	Oct.	9-10	VK/ZL/Oceania C.W. Contest
	Oct.	16-17	Boy Scounts Jamboree
	Oct.	16-17	Pennsylvania QSO Party
	Oct.	16-17	ARCI QRP C.W. Contest
	Oct.	**30-31**	**CQ WW DX Phone Contest**
	Nov.	13-14	European RTTY Contest
	Nov.	**27-28**	**CQ WW DX C.W. Contest**

**Covered last month.*
***See June Calendar.*
†Not official.

Illinois QSO Party

1800Z Sat. July 31 to 0500 Sun. Aug. 1
1200Z Sun. Aug. 1 to 2300 Sun. Aug. 1

This is the 20th annual party sponsored by the Radio Amateur Megacycle Society. The same station may be worked on each band and each mode.

Exchange: RS(T) and QTH. County for Illinois stations; state, province, or country for others.

Scoring: One point per contact, 2 points if it's with a Novice or Technician.

Illinois stations multiply total QSO points by the sum of states (max. 50), VE/VO call areas (max. 10), and no more than 5 DX countries worked (max. multiplier of 65).

Out-of-state stations multiply total QSO points by Illinois counties worked (max. of 102).

Illinois mobiles or portables operating away from normal QTH may add 200 points to final score for each county of operation from which 10 or more contacts were made.

There is a bonus for out-of-state stations, a multiplier of one for each group of 8 contacts with the same county.

Frequencies: C.W.—About 60 kHz from low end of each c.w. band. Phone—3975, 7275, 14275, 21375, 28675. And 25 kHz from low end of each Novice band on the hour and the half hour.

Awards: Certificates to the top scorers in the following categories: Single operator, multi-operator, both single and multi-transmitter, mobile, portable, Novice, and Technician. In each state, VE/VO province, DX country, and first 3 places in Illinois. There are also club awards.

A summary sheet is requested showing the scoring and other essential information. Include a large s.a.s.e. for copy of the results.

Mailing deadline is Sept. 15th to: RAMS, K9CJU, 3620 N. Oleander Ave., Chicago, IL 60634.

Romanian Contest

Starts: 1800 GMT Sat. Aug. 7
Ends: 1800 GMT Sun. Aug. 8

This one is sponsored each year by the Romanian Amateur Radio Federation.

You may work other European countries as well as the Romanian stations on each band and mode, 3.5 through 28 MHz. The same station may be worked only once per band, either on c.w. or on phone.

Classes: Both single and multi-operator, single and all band for both divisions.

Exchange: RS(T) and a QSO number starting with 001. YO stations will also include two letters denoting their county (569001/SJ).

Scoring: *For Europeans*—Two points for DX contacts; six points if it's with a YO station.

For others—Two points for European QSO's; 10 points if it's with a YO station.

Multiplier: DX countries worked on each band for the Europeans. Others will use European countries and YO counties worked on each band. (There are approximately 40 YO counties.)

Final Score: Total QSO points time the sum of the multiplier from each band.

Awards: Certificates to the top scorers

in each country in each class, and a Crystal Cup to the overall champion.

Include a summary sheet and a signed declaration with your entry. (Inquire about the several YO awards. No details were given.)

Mailing deadline is September 1st to: Romanian Amateur Radio Federation, P.O. Box 1395, 7000 Bucuresti 5, Romania.

European DX Contest

C.W.: Aug. 14–15 Phone: Sept. 11–12
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is the 27th annual contest sponsored by the DARC. The activity will be between European countries and the rest of the world on all bands 3.5 through 28 MHz.

Following are updated rules, including two new features. U.S. states will now count as a multiplier. Also, QSO dupe sheets will now be required for each band on which 200 or more contacts are made.

Only 36 hours out of the 48-hour contest period may be used by single-operator stations. The 12-hour off periods may be taken in one, but not more than three, periods anytime in the contest and must be indicated in the log.

Classes: Single operator and multi-operator single transmitter, both all bands. Multi-operator stations are allowed to change bands one time only within a 15-minute period. A quick band change and return is allowed to work a new multiplier.

Exchange: RS(T) plus a QSO number starting with 001. In addition, W/K stations will include their state (*i.e.*, 599011 MA).

Scoring: One point per QSO and one point for each QTC reported.

Multiplier: The multiplier for non-European stations is determined by the number of European countries worked on each band (WAE list). Europeans will use the ARRL DXCC list. In addition, each call area of the following countries will be considered a multiplier: JA, PY, VE/VO, VK, ZL, ZS, UA9Ø. *Each W/K state will also be considered a multiplier.*

In addition, the multiplier on 3.5 MHz may be multiplied by 4, on 7 MHz by 3, and on 14/21/28 MHz by 2.

Final Score: Total QSO points, plus QTC points, times the sum total multiplier from all bands.

QTC Traffic: Additional point credit can be realized by making use of the QTC traffic feature. A QTC is a report of a confirmed QSO that has taken place earlier in the contest and was later sent back to a European station. It can only be sent from a non-European station back to a European, the general idea being that after a number of Europeans have been worked, a list of these stations can be reported back during a QSO with another station.

An additional one point credit can be claimed for each station reported.

A QTC contains the time, call, and QSO number of the station being reported (*i.e.*, 1300/DL2DN/134). This means that at 1300Z you worked DL2DN and received #134.

A QSO can be reported only once and not back to the originating station.

There is a maximum of 10 QTC's to a station. The same station may be worked several times to complete this quota. Only the original contact, however, has QSO value.

Keep a uniform list of QTC's sent; 3/7 indicates that this is the 3rd series of QTC's sent and that 7 QSO's are being reported.

Awards: Certificates to the top scorers in each class in each country and areas listed in the multiplier. Continental leaders and stations having at least half the score of the continental leader will also be honored.

Disqualification: Violation of the rules of the contest, unsportsmanlike conduct, or taking credit for excessive duplicate contacts will be deemed sufficient cause for disqualification.

Logs: It is suggested that you use the official DARC or equivalent forms. Figure 40 contacts to the page, and use a separate sheet for each band. A large-size s.a.e. and IRC's will get you a supply.

Remember, all entrants are now required to submit cross-check dupe sheets for each band with 200 or more QSO's.

A penalty of 3 contacts will be deducted for each duplicate QSO that is removed by the Committee.

Mailing deadline is Sept. 15th for c.w. entries and Oct. 15th for the phone entries.

This year all entries go to: The WAEDC Contest Committee, P.O. Box 1328, D-895 Kaufbeuren, Fed. Rep. of Germany. (The U.S.A. address is no longer available.)

European Country List: C31, CT1, CT2, DL, EA, EA6, EI, F, FC, G, GD, GI, GJ, GM, GM Shetland, GU, GW, HA, HB9, HBØ, HV, I, IS, IT, JW Bear, JW, JX, LA, LX, LZ, M1, OE, OH, OHØ, OJØ, OK, ON, OY, OZ, PA, SM, SP, SV, SV Crete, SV Rhodes, SV Athos, TA1, TF, UA1346, UA2, UA Franz Josef Land, UB5, UC2, UN1, UO5, UP2, UQ2, UR2, Y2, YO, YU, ZA, ZB2, 1AØ, 3A, 4U1, 9H1.

New Jersey QSO Party

Two Periods UTC
2000 Sat. to 0700 Sun. Aug. 14–15
1300 Sun. to 0200 Mon. Aug. 15–16

This is the 23rd annual party sponsored by the Englewood A.R.A. Phone and c.w. are part of the same contest, the same station may be worked on each band and mode, and NJ may work in-state stations for QSO and multiplier credit.

Exchange: QSO no., RS(T) and QTH. County for NJ, ARRL section or country for others.

Scoring: NJ stations score 1 point for

W/K and VE/VO contacts, 3 points for DX. Multiply total by ARRL sections worked (max. of 74). KP4, KH6, KL7, etc., are 3 point contacts and section multipliers.

Out-of-state stations multiply total NJ QSO's by total of NJ counties worked (max. of 21).

Frequencies: 1810, 3535, 3900, 7035, 7135, 7235, 14035, 14280, 21100, 21355, 28100, 28610. Try phone on even hours, 15 on odd hours, and 160 at 0500 GMT.

Awards: Certificates to the top scorers in each NJ county, ARRL section, and DX country. Second place awards if four or more logs are received from that section. Also Novice and Tech. awards.

Use UTC, indicate the multiplier only the first time it is worked, include a QSO check sheet and a summary sheet showing the scoring, etc. Also include a large s.a.s.e. if you wish a copy of the results.

Stations planning activity in NJ are requested to advise the E.A.R.A. by August 1st so that coverage of all counties may be planned.

Logs must be received no later than Sept. 11th and go to: Englewood A.R.A., P.O. Box 528, Englewood, NJ 07631.

S.A.R.T.G. RTTY Contest

Three Periods GMT
0000–0800 & 1600–2400 Sat., Aug. 21
0800–1600 Sunday, Aug. 22

This is the 11th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group. Use all bands 3.5 through 28 MHz. The same station may be worked on each band for QSO and multiplier credit.

Classes: Single operator, multi-operator single transmitter and s.w.l.

Exchange: QSO no., signal report.

Points: QSOs with own country, 5 points. With other countries on same continent, 10 points. With other continents, 15 points. The U.S., Canada, and Australia call areas count as separate countries for scoring.

Multiplier: Each DXCC country and each W/K, VE/VO, and VK call area. A multiplier will not be considered unless the claimed station appears in at least five logs, or a log is received from that station.

Final Score: Sum of QSO points from all bands times the sum of the multiplier from each band.

S.w.l.'s use same scoring but based on sum of stations and messages copied.

Awards: Certificates to the top-scoring stations in each class in each country and each call area of the U.S., Canada, and Australia.

Use a separate sheet for each band, and include a summary sheet showing the scoring, comments, and other essential information, and your name and address in block letters.

Logs must be received by October 10th and go to: S.A.R.T.G. Contest Manager, P.O. Box 717, DK 8600 Silkeborg, Denmark.

Alaska QSO Party

0200Z Sat. to 0200Z Mon., Aug. 21–23

Here's a new one sponsored by the Alaska DX Association. All bands, 10 through 160 will be activated, offering a good opportunity to pick up those vacant spots for 5 Band WAS, WAZ, DXCC, etc.

The same station may be contacted on each band, c.w. and s.s.b., for QSO credit, but counted once only as a multiplier.

Exchange: RS(T) and judicial district for KL7's. RS(T), QSO no., and state, province, or country for others.

Points: *For Alaskans*—QSO's on 10, 15, and 20 count 2 points. On 40, 80, and 160 they count 5 points.

For non-Alaskans—On 10, 15, and 20

QSO's count 5 points. On 40, 80, and 160 they count 10 points.

Multiplier: *For Alaskans*—States, VE provinces, and DXCC countries worked on each band.

For non-Alaskans—KL7 judicial districts (1–4) worked on each band.

Final Score: Total QSO points from all bands times the sum of the multiplier from each band.

Frequencies: 10 kHz inside each General Class segment, both on c.w. and s.s.b.

Awards: Certificates to the winner in each state, VE province, and DX country. The top Alaskan and non-Alaskan will receive an Alaskan Goldpanner Plaque.

Logs and summary sheets must be received no later than October 1st and go to: Alaska DX Association, KL7AF, P.O. Box 1614, Kodiak Island, Alaska 99615.

Alabama QSO Party

0000Z Sat. to 2400Z Sun., Aug. 28–29

This party is again being sponsored by the Chattahoochee Valley A.R.C.

The same station may be worked once on each band and each mode, mobiles on each county change, and Alabama to Alabama contacts are permitted.

Exchange: RS(T) and QTH. County for Alabama; state, province, or country for all others.

Scoring: One point per QSO. Alabama stations multiply total by sum of states, VE provinces, and countries worked. All others multiply total Alabama contacts by sum of Alabama counties worked (max. 67).

Frequencies: C.W.—3565, 7065, 14065, 21065, 28065. Phone—3965, 7265, 14285, 21365, 28565. Novice—7125, 21125, 28125.

Awards: Certificates to top scorers in each state, VE province, and DX country. Also to top Novice/Tech. in Alabama and out of state. Plaques to the overall Alabama and out-of-state winners.

Mailing deadline is September 30th to: Johnny Royster, WA4VEK, P.O. Box 494, Fairfax, AL 36854. Include a large s.a.s.e. for a copy of the results.

Occupation Contest

Starts: 1800Z Sat., Aug. 28
Ends: 2400Z Sun., Aug. 29

The Radio Association of Erie, PA, is again sponsoring this unusual activity. The purpose of the contest is to contact other hams and exchange occupations.

Exchange: RS(T), your occupation, and state, province, or country.

Scoring: One point per QSO. The multiplier will be determined by the number of similar occupations you contact. A multiplier of one for every three similar occupations worked. Try to keep titles in general fields (*i.e.*, engineer, technician, machinist, salesman, etc.). (What about retirees?)

Frequencies: C.W.—50 kHz up from bottom of each band. Phone—50 kHz down from top of each band. (Simples contacts only, no repeaters.)

Awards: A Plaque to the top-scoring station. Certificates to the winner in each state, province, and DX country.

Mailing deadline is October 1st and logs go to: Chris Robson, KB3A, 6950 Kreider Road, Fairview, PA 16415.

Aruba Field Day

1200Z Sat. to 1600Z Sun., Sept. 4–5

To celebrate the 25th year of its founding, the Aruba Amateur Radio Club has organized this activity for the month of September.

On the weekends following the Field Day, the club station with the special call P43A will also be on the air from 1400Z Saturday to 1900Z Sunday.

A special certificate commemorating this event will be awarded to all who contact at least three Aruban stations (PJ3 calls), one of which has to be P43A.

There are other special events planned during this period. A letter to the club will get you a program, in case you plan to visit Aruba.

Your application log for the certificate must be received no later than November 30th by the Aruba Amateur Radio Club, P.O. Box 273, San Nicolas, Aruba, Netherlands Antilles.

Bulgarian C.W. Contest

0000Z to 2400Z Sunday, Sept. 5

This is a world-wide contest open to all, but with emphasis on working LZ's.

Classes: *A.* Single operator, single band. *B.* Single operator, all band. *C.* Multi-operator, all band. *D.* S.w.l.'s. Use all bands, 3.5 through 28 MHz.

Exchange: RST plus your ITU zone.

Scoring: One point for QSO with stations in the same continent (including same country), 3 points if in another continent, and 6 points for LZ contacts.

S.w.l.'s score 3 points if both calls and exchanges are reported, and 1 point if both calls but only one exchange.

Multiplier: Sum total of ITU zones worked on each band.

Final Score: Total QSO points from all bands times the total multiplier.

Awards: Medals to the top three world scorers in classes *A* and *B*. Cup and medals to classes *B* and *C*. Medals to continental leaders and s.w.l.'s.

Use a separate log sheet for each band, a summary sheet showing the scoring, and the usual signed declaration, plus your name and address in block letters.

Contest contacts may be used for the many LZ awards. Write to the BFRA for details.

Mailing deadline for logs is October 5th to: Bulgarian Federation of Radio Amateurs, P.O. Box 830, Sofia 1000, Bulgaria.

a monthly feature by
DAVE INGRAM, K4TWJ

The World of Video

A LOOK AT THE WORLD AROUND US

More Basics, Plus A Look At FSTV

If we were to speculate on an area of the world with outstanding involvement in amateur video, that locale would definitely be Australia. Fast Scan TV has been a very popular and widely accepted mode in Australia for many moons. This country is also one of the few areas using FSTV repeaters successfully. The Adelide repeater, as you may have heard, is authorized to output on commercial TV channels, thus permitting public observation/involvement in amateur activities.

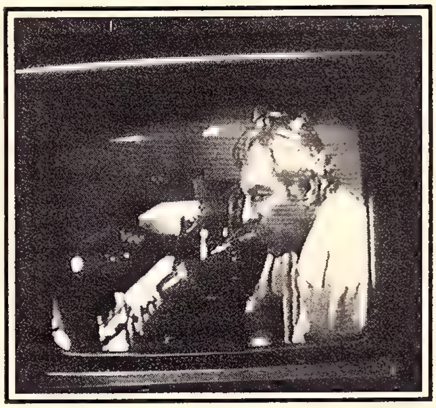
An impressive assortment of FSTV gear is available to VK amateurs. If there's doubt on the validity of that statement, ask the next VK amateur you contact about ATV activity in his area. During recent years Slow Scan TV activity has also begun to flourish "down under."

The Australian magazine *Amateur Radio Action* recently carried a four-part series by VK2XY and ZL1LH describing a receive-only digital scan converter which could be completely home constructed for under $200. An additional $125 would set the unit receiving real-time color. This unit is a true gem. Its black-and-white memory includes four 16K RAM's for a total of 65K memories. PC boards and/or kit availability from VK2XY or ZL1LH is promoting SSTV activity. As a result, we expect a flurry of SSTV operations from "down under" very soon. Australian video involvement is quite impressive, and judging by their past "track records," they may soon become a world leader in its development and applications. A continental merging of efforts would surely prove beneficial.

More SSTV Basics

Last month's column laid the groundwork for basic SSTV activities by video newcomers. Let's continue that discussion this month with a general outline of operations pertaining to commercially manufactured digital scan converters such as the popular Robot 400.

In addition to their primary function as dual-mode converters (Slow to Fast and Fast to Slow), commercial scan conversion units also serve as central station controls for SSTV activity. The microphone is connected to the converter for front-panel selection of "straight through" voice operation or SSTV transmission. The unit's SSTV input is connected in parallel with the station receiver's speaker for acquiring incoming views, while a tape recorder's input and output are also rear-panel connected to the scan converter. Inclusion of a Fast Scan camera then rounds out the system.



FSTV view of Roland, N6WQ, relaying Slow Scan to Fast Scan signals between 10 meters and 70 centimeters. (Photo courtesy W6ORG)

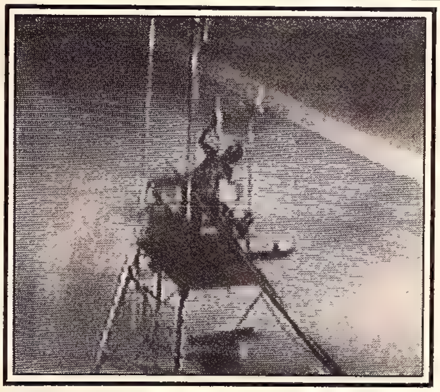
A front-panel switch on the scan converter permits in-station viewing of signals from the camera, receiver, tape recorder, etc. (both Robot and Wraase are similar in function). Another front-panel switch determines whether audio from the tape recorder, scan converter output, or microphone feeds the transmitter. Separate brightness and contrast controls for the incoming SSTV and the in-station camera eliminate constant fumbles, while reducing up and down moves during "live" transmissions (a true blessing). Beyond this point, a number of options are available to the SSTVer.

During SSTV operations, for example, one can "cue" a tape for immediate transmission and then switch the scan converter to view incoming signals. A particularly interesting picture can be stored in memory for extended viewing, while another front-panel switch allows the in-station monitor to view either the memory-stored scene or the camera's view (nice for setting up your own pictures while sequentially viewing others). When desired, another switch replaces the memory-stored picture with that from the camera. Two options are possible during transmission: either a scan-converter-stored picture or a taped view may be instantly transmitted. Assuming the station camera is focused on the operator or some special item of interest, the recorder can be used for transmitting ID's, etc., while the scan converter can be used for viewing and instantly retransmitting incoming SSTV scenes.

If the above isn't enough flexibility for you, the Robot 400 includes another switch position for a second tape recorder or SSTV signal source! I personally prefer leaving my microphone connected to the h.f. transceiver's normal input and connecting the scan converter's "audio output line" to the microphone patch input. In addition to the neater wiring (somehow it doesn't seem right to run a mike lead to the scan converter), I can

Well, you asked for shack views, so here's the main setup at K4TWJ (the parts that will fit into one photo). (A second desk with IC-730, kw amplifier, SSTV, OSCAR gear, QRP gear, etc., is behind operator.) Robot 400 is flanked by homebrew monitor and RTTY setup. Small Sony TV displays Slow Scan. FT-901DM and L4 "loaf along" in SSTV mode. Amateur magazines on desk are from England, New Zealand, Australia, Hong Kong, Japan, and U.S.S.R.

*Eastwood Village No. 1201 So., Rt. 11 Box 499, Birmingham, AL 35210



FSTV view of Ernie, WB6BAP, setting up a 450 MHz Isopole on a boat for ATV coverage during the Congressional Cup Yacht Race at Long Beach, California. ATV is used each March for coordination of this event, which sports teams from around the world competing on 38 foot Catalina sailboats. (Photo courtesy W6ORG)

talk before, during, or after picture transmissions. The scan converter output, tape recorder, and mike levels can be adjusted independently, and full VOX operation can be enjoyed. In fact, a prerecorded tape can call CQ and the rig will automatically switch back to receive at the end of the tape.

These "hands-free operations" take a few minutes to master, but they're definitely worth the effort. You can transmit from the camera, describe the view, switch on the tape, change camera views, and then transmit another picture without worrying about anything except output power level (remember last month's notes?). If you decide to use a home computer system for SSTV, take a few extra minutes (hours) to build a station switching-device/controller similar to those included in the "front area" of commercial units. That additional flexibility makes SSTV activities a true pleasure.

Looking at Fast Scan TV

Has this video column inspired many of you Slow Scanners to try Fast Scan (and vice versa)? Actually, the two modes compliment each other in a manner somewhat similar to 2 meter f.m. and h.f. s.s.b. operations (either may be enjoyed independently, but they're twice the fun when occasionally intermixed). For many years the most popular ATV band has been 436 MHz, but recent developments in FSTV gear for 1265 MHz and 2300 MHz could change that situation. The use of crossband repeaters for FSTV provides a simplified form of installation, while permitting newcomers to perform direct on-the-air checks via the repeater in a duplex fashion with few intermod-related entanglements. The availability of MDS downconverters which can easily be retuned for amateur band reception could make them appealing. However, a direct comparison in line-of-sight paths between 435 MHz and 2300 MHz indicates a 12 dB signal loss at that higher frequency. This loss must be overcome through the use of additional r.f. power and higher gain antennas.

High-power ATV transmitters for 2300 MHz are also difficult to locate. (This situation hopefully will change by the time this article appears in print.) Meanwhile, 436 MHz and 1265 MHz transmitting and receiving equipment is readily available from outstanding sources such as P.C. Electronics in California, Silvernail Electronics in Florida, etc. These units work great and require miniscule technical proficiency for installation and use. An initially small group in almost any area of the nation might begin their activities by independently purchasing ATV transmitting and receiving gear while a financial pooled repeater supports that activity.

Consider, for example, the success of W6ORG's efforts in southern California. That crossband ATV repeater has been on the air approximately three years and boasts a surprising amount of resultant ATV interest. Weekly ATV net check-ins number between 30 and 40, a figure com-

parable to many 2 meter f.m. groups. The W6ORG machine includes a 146.43 MHz input/output link for allowing non-ATV operators to participate in the audio side of these communications. Nice feature.

Frequencies used in the 70 cm band vary among different areas of the nation. Southern California activity, for example, favors 434 MHz, while the midwestern area favors 439.29 MHz. The prime ATV DX band is 70 cm, with video contacts occasionally spanning several hundred miles, depending on r.f. power, antennas, and terrain. "Direct" communication range on 1265 MHz is usually less than 435 MHz (neglecting inversion propagation and signal ducting), but good line-of-sight communications can be expected. This condition may be enhanced by the use of relatively high r.f. levels and high-gain low-noise preamplifiers mounted at the antenna proper. The 25 watt W6ORG machine usually puts out snow-free 1265 MHz signals for a line-of-sight radius of 40 miles (with no inversion). This is based on the use of a TVC-12A downconverter mounted on a 1296 LY Loop Yagi, resulting in a 46 dB signal-to-noise ratio at the TV receiver proper.

Another interesting concept which holds merit for ATV use involves the inclusion of 10 GHz links. Due to this system's multi-channel bandwidth, it can be used in conjunction with existing repeaters and FSTV group activities. A 10 GHz link, for example, can relay repeater activities, TV games, and computer displays simultaneously. Space Invaders and Pac Man via 10 GHz? Why not. It can make an ATV setup one of the home's most popular entertainment systems.

Wrap Up

Another computer company, Commsoft, 665 Maybell Avenue, Palo Alto, CA 94306, has joined our SSTV ranks. Their recently introduced photocaster package features a direct plug-in board and associated software for using the Apple II computer as a high-resolution scan converter. The system boasts 16 shades of gray in the black-and-white mode and 8 colors in the color mode. Hard copies with 16 gray levels can be made with a standard MX-80 printer. Numerous other features are also available. Apple lovers rejoice!

Jim Thomas, WB4HCV, reports that his company is reconsidering the SSTV field, and a black-and-white/color scan converter may be forthcoming. The planned unit will feature everything from high-resolution and zoom options to direct computer and printer interfaces. More details as available.

There are more things happening this month than there is available space, gang, so we'll continue these discussions next month. Until then, we'll look for you on the air and watch the mailbox for your photos and notes.

73, Dave, K4TWJ

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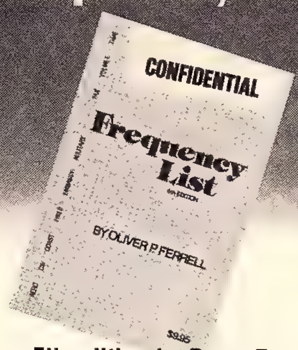

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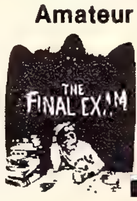

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MRF 454	18.95	2N3055	.95
MRF 455	12.50	2N6084	12.50

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Announcing

(from p. 10)

Aug. 19, **Five County Swap & Shop**, Flint, MI. Contact Perry Baker, WA8THK, 9055 Grand Blanc Rd., Gaines, MI 48436.

Aug. 29, **Lebanon Hamfest**, Lebanon, TN. Contact Mary Alice Fanning, KA4GSB, 4936 Danby Dr., Nashville, TN 37211.

Aug. 29, **4th Annual GCARC Ham/Comp Fest**, Sewell, NJ. Contact GCARC Hamfest Committee, P.O. Box 370, Pitman, NJ 08071.

● **These Special Event Stations will be on the air in August:**

W2ZJ, Elmira, NY, Area Amateurs, July 31–Aug. 1, 1300–2100Z, 30 kHz up from lower edge of General phone band on 20, 40, 80 meters. QSL to ARS W2ZJ, General Delivery, Elmira, NY 14904 (s.a.s.e.).

WB7SGU, Pend Oreille ARC, July 31–Aug. 1, 1600Z–band drops, on 21.300 MHz. QSL to WB7SGU (s.a.s.e.).

KA2CGV, Allegany Highlands ARC, Aug. 1, 1300–2100Z, on c.w. 7.125, 14.060, 21.060, 28.060, phone 7.280, 14.280, 21.380, 28.580. QSL to AHARC, P.O. Box 373, Friendship, NY 14739 (s.a.s.e.).

VE3ROW, Niagara Peninsula ARC, Aug. 1–8 on all bands 160–10 meters. QSL with log data to VE3ROW, c/o NPARC, P.O. Box 692, St. Catherines, Ontario, Canada L2R 6Y3.

AK3J, Somerset County ARC, Aug. 7–8, 1800–1800 UTC in the first 25 kHz in the General section phone and Novice section c.w. QSL and $1.00 to Box 468, Somerset, PA 15501.

K2AE, Schenectady ARA (from Crown Point, NY), Aug. 14–15, on lower 10 kHz of General bands. QSL to P.O. Box 6, Alplaus, NY 12008 (s.a.s.e.).

WD8KWC, Logan County, WV, ARA Mini-Expedition, Aug. 14–15, 1600–1600 UTC, on phone 25 kHz from low end of General phone bands. (Novice Aug. 17–18, 1600–0400 UTC, 3725 and 7125 each hour.) QSL to Basil Napier, WD8KWC, RFD 1, Box 198, Chapmanville, WV 25508 (s.a.s.e.).

W4KON, Smyth County, VA, Amateurs, Aug. 21, 0000–2100Z, on 15, 40, 80 meters up 10 kHz from bottom of General phone band, Novice c.w. as activity dictates. QSL to Ken Sturgill, KC4IH, P.O. Box 526, Marion, VA 24352 (s.a.s.e.).

WA8HUR, Huron County, OH, ARC, from Lake Erie, Aug. 21–22, 1000–0000Z, s.s.b. 3910, 7250, 14280, 21360, 28550 kHz, c.w. 40 kHz up from bottom of each h.f. band, Novice 3720 and 7115 kHz, f.m. 146.52 MHz. QSL to ARS KF8O (s.a.s.e.).

W0QQQ, Kansas State University ARC and Manhattan Area ARS, to Flush County, KS, Aug. 29, 24 hours of operating beginning at 0000 UTC, c.w. 21.112 or 7.112 MHz, phone 14.292 or 3.892 MHz. QSL to W0QQQ, Electrical Engineering Dept., Kansas State University, Manhattan, KS 66506 (s.a.s.e.).

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Advertising Rates: Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge $1.00. No ad (non subscriber) will be printed unless accompanied by full remittance. Non-commercial ads free to CQ subscribers (maximum 3 lines per month). All ads must be typewritten double spaced. Recent CQ mailing label must accompany ad. **Closing Date:** The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: CQ Ham Shop, 76 N. Broadway, Hicksville, NY 11801.

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WANTED: Early Hallicrafter "Skyriders" and "Super Skyriders" with "Silver" panels. Also "Skyrider Commercial" early transmitters such as HT-1, HT-3, HT-19, and other Hallicrafter gear, parts, accessories, manuals. Chuck Dachis, WD5EOG, The Hallicrafter Collector, 4500 Russell Drive, Austin, TX 78745.

QSL CARDS: $12.50/500, ppd. 400-illustration catalogue free. Bowman, 743 Harvard, St. Louis, MO 63130.

WANTED: Surplus 1–3 KW HF Transmitter type FRT-15, Collins TDH or equivalent or higher power up to 20 KW. SSB not necessary. P.J. Plishner, WA1LDU, 2 Lake Avenue Ext., Danbury, CT 06810.

QST FOR SALE 1927 to 1980. S.A.S.E. for information. W3ICZ, Box 1580, Hemlock Farms, Hawley, PA 18428.

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HAM-AD-FEST™: Next 6 issues $2.00. WA4OSR, Box 973-C, Mobile, AL 36601.

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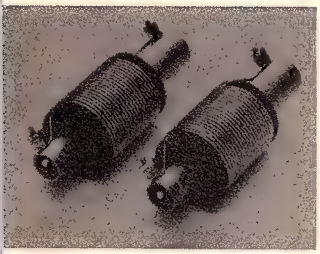

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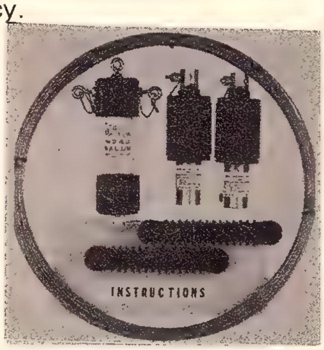

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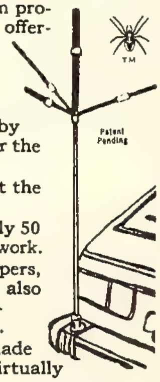

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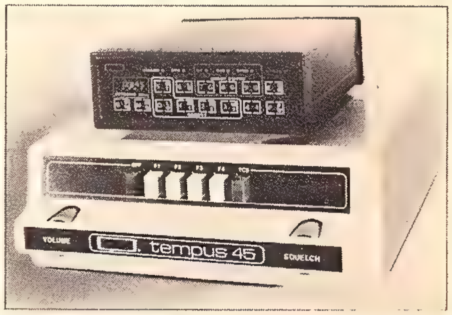

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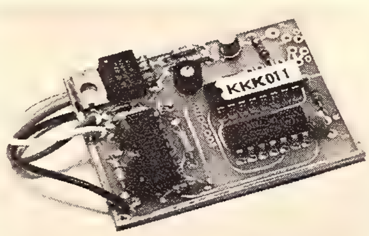

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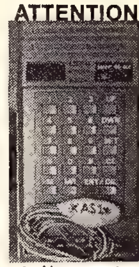

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e FT-102 utilizes an advanced 8.2 MHz and 455 kHz IF system, capable of cepting as many as three filters in cascade. Optional filters of 2.9 kHz,1.8 z, 600 Hz, and 300 Hz may be combined with the two stock 2.9 kHz filters for erating flexibility you've never seen in an HF transceiver before now!

New Receiver Front End
lizing husky junction field-effect transistors in a 24 volt, high-current design, FT-102 front end features a low-distortion RF preamplifier that may be byssed via a front panel switch when not needed.

Notch and Audio Peak Filter
ıighly effective 455 kHz IF Notch Filter provides superb rejection of heteroıes, carriers, and other annoying interference appearing within the IF passıd. On CW, the Audio Peak Filter may be switched in during extremely tight -up conditions for post-detection signal enhancement.

riable IF Bandwidth with IF Shift
FT-102's double conversion receiver features Yaesu's time-proven Variable ıdwidth System, which utilizes the cascaded IF filters to provide intermediate ıdwidths such as 2.1 kHz, 1.5 kHz, or 800 Hz simply by twisting a dial. The iable Bandwidth System is used in conjunction with the IF Shift control, ch allows the operator to center the IF passband frequency response without ying the incoming signal pitch.

de/Narrow Filter Selection
ıending on the exact combination of optional filters you choose, a variety of e/narrow operating modes may be selected. For example, you may set up kHz in SSB/WIDE, 1.8 kHz in SSB/NARROW, then select 1.8 kHz for CW/)E, and 600 Hz or 300 Hz for CW/NARROW. Or use the Variable Bandwidth set your SSB bandwidth, and use 600 Hz for CW/WIDE and 300 Hz for /NARROW! No other manufacturer gives you so much flexibility in selecting r responses!

iable Pulse Width Noise Blanker
tion noise, the "Woodpecker," and power line noise are modern-day enes of effective Amateur operation. The FT-102 Noise Blanker offers improved king action on today's man-made noise sources (though no blanker can inate all forms of band noise) for more solid copy under adverse conditions.

v Distortion Audio/IF Stage Design
/ that dynamic range, stability, and AGC problems have been largely elimid thanks to improved technology, Yaesu's engineers have put particular ıtion on maximizing intelligence recovery in the receiver. While elementary cascading schemes often degrade performance, the FT-102's unique blend ystal and ceramic IF filters plus audio tone control provides very low phase /, reduced passband ripple, and hence increased recovery of information.

Heavy Duty Three-Tube Final Amplifier
The FT-102 final amplifier uses three 6146B tubes for more consistent power output and improved reliability. Using up to 10 dB of RF negative feedback, the FT-102 transmitter third-order distortion products are typically 40 dB down, giving you a studio quality output signal.

Dual Metering System
Adopted from the new FT-ONE transceiver, the Dual Metering System provides simultaneous display of ALC voltage on one meter along with metering of plate voltage, cathode current, relative power output, or clipping level on the other. This system greatly simplifies proper adjustment of the transmitter.

Microphone Amplifier Tone Control
Recognizing the differences in voice characteristics of Amateur operators, Yaesu's engineers have incorporated an ingenious microphone amplifier tone control circuit, which allows you to tailor the treble and bass response of the FT-102 transmitter for best fidelity on *your* speech pattern.

RF Speech Processor
The built-in RF Speech Processor uses true RF clipping, for improved talk power under difficult conditions. The clipping type speech processor provides cleaner, more effective "punch" for your signal than simpler circuits used in other transmitters.

VOX with Front Panel Controls
The FT-102 standard package includes VOX for hands-free operation. Both the VOX Gain and VOX Delay controls are located on the front panel, for maximum operator convenience.

IF Monitor Circuit
For easy adjustment of the RF Speech Processor or for recording both sides of a conversation, an IF monitor circuit is provided in the transmiter section. When the optional AM/FM unit is installed, the IF monitor may be used for proper setting of the FM deviation and AM mic gain.

WARC Bands Factory Installed
The FT-102 is factory equipped for operation on all present and proposed Amateur bands, so you won't have to worry about retrofitting capability on your transceiver. An extra AUX band position is available on the bandswitch for special applications.

Full Line Of Accessories
For maximum operating flexibility, see your Authorized Dealer for details of the complete line of FT-102 accessories. Coming soon are the FV-102DM Synthesized VFO, SP-102 Speaker/Audio Filter, a full line of optional filters and microphones, and the AM/FM Unit.

CIRCLE 48 ON READER SERVICE CARD

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